EDAN INSTRUMENTS, INC.

CE 0123

DUS 3

Digital Ultrasonic Diagnostic Imaging System

User Manual

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Statement

This manual will help you understand the operation and maintenance of the product better. It is reminded that the product shall be used strictly complying with this manual. User's operation failing to comply with this manual may result in malfunction or accident for which Edan Instruments, Inc. (hereinafter called EDAN) can not be held liable.

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EDAN only considers itself responsible for any effects on safety, reliability and performance of the equipment if:

Assembly operations, extensions, re-adjustments, modifications or repairs are carried out by persons authorized by EDAN, and

The electrical installation of the relevant room complies with international standards, and

The equipment is used in accordance with the instructions for use.

Upon request, EDAN may provide, with compensation, necessary circuit diagrams, and other information to help qualified technician to maintain and repair some parts, which EDAN may define as user serviceable.

Using This Guide

This guide is designed to give key concepts on safety precautions.

⚠WARNING⚠:

A **WARNING** label advises against certain actions or situations that could result in personal injury or death.

⚠CAUTION⚠:

A **CAUTION** label advises against actions or situations that could damage equipment, produce inaccurate data, or invalidate a procedure.

NOTE:

A NOTE provides useful information regarding a function or a procedure.

Revision History

Date	ECO#	Version	Description
2008/10/23	ECO-DUS-8001	V1.1	Added two obstetrical formulas. Revised buttons' function. Added EMI& acoustic output affecting factors. Revised specifications. Added some precautions during puncture function. Revised the auto-serial number when saving images. Revised the labeling symbols. Added daily check list. Revised Probe Cleaning and Disinfecting.
2008/12/30	ECO-DUS-8003	V1.2	Added the Rx only information. Revised the intended use. Revised the symbols. Revised the Configuration. Revised the Life Period. Revised the Cleaning and Disinfecting information. Revised the Measurement Accuracy.
2009/04/24	ECO-DUS-9003	V1.3	Added the 3-Aixs (LWH) method, inputting focus, DICOM function, file browsing, file sending, and transducer power values; Revised the preface and contact information, the range of parameters, and the Cleaning and Disinfecting information. Add the silica gel pads.

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Chapter 1 Introduction

1.1. Intended Use

The DUS 3 Digital Ultrasonic Diagnostic Imaging System is intended for diagnostic ultrasound imaging analysis in gynecology rooms, obstetrics rooms, examination rooms, intensive care units, and emergency rooms. The DUS 3 is intended for use by or on the order of a physician or similarly qualified health care professional for ultrasound evaluation of Fetus; Abdomen; Pediatrics; Small Organ; Neonatal Cephalic; Cardiology; Peripheral Vessel; Musculo-skeleton (both Conventional and Superficial); Urology (including prostate); Transrecta and Transvagina

1.2. Features

This portable device, Digital Ultrasonic Diagnostic Imaging System (DUS 3), is a high-resolution linear/convex scanning diagnostic apparatus.

Applied technologies:

Tissue Specific Imaging (TSI), Tissue Harmonic Imaging (THI), Digital Beam-Forming (DBF), Dynamic Receiving Focusing (DRF), Real-time Dynamic Aperture (RDA), Dynamic Frequency Scanning (DFS), and Dynamic Apodization.

Display modes:

B, B+B, 4B, B+M, and M.

Measurement and calculation functions:

B-mode generic measurement and calculation: Distance, circumference, area, volume, ratio, % stenosis, and angle;

M-mode generic measurement and calculation: Time, slope, and heart rate.

File management:

It supports local disk and removable disk storage. USB 1.1 interface enables fast image uploading to your computer in the real-time mode. It has huge storage capacity.

Operation:

The folding keyboard designed with trackball is easy and convenient for various types of operation.

In addition, 10" non-interlaced progressive display and diverse probes are adopted to provide a clear and stable image.

1.3. Model

DUS 3

1.4. Contraindication

- The equipment is not applicable to the diagnosis of the pneumatic organs that contain gas such as lung, stomach, intestines, etc.
- It is recommended not to examine the parts with wounds or acute inflammation to avoid cross infection.
- Patients in the following situations are not allowed to be examined with E611-1 probe: vaginal infection (such as trichomonal vaginitis, colpomycosis, venereal disease etc.), the unmarried, vagina deformity, menstrual period, postmenopausal vagina atrophy, difficulty in per vagina ultrasonic examination, colporrhagia, Pyrilamine placenta previa, etc.

1.5. General Safety Precaution Information

1.5.1. General Information

NOTE: This equipment is not intended for home use.

⚠**WARNING**⚠**:** This equipment is not intended for treatment.

CAUTION: Federal (U.S.) law restricts this device to sale by or on the order of a physician.

CAUTION: The pictures and interfaces in this manual are for reference only.

The reliability of the device and the safety of operators and patients are considered during product design and production. The following safety and preventive measures should be carried out:

1. The device should be operated by qualified operators or under their instructions.
2. DO NOT alter parameters of the device at will. If it is necessary, please consult EDAN or authorized representatives for service.
3. The device has already been adjusted to its optimum performance. DO NOT adjust any pre-set control or switch, unless it is listed in the manual.
4. If the device breaks down, please shut down the machine immediately and contact EDAN or authorized representatives.
5. Only accessories supplied or recommended by EDAN can be used. Otherwise, the performance and electric shock protection can not be guaranteed. If electrical or mechanical equipment from other companies need to be connected to the device, please contact EDAN or authorized representatives before connection.
6. **EXPLOSION HAZARD**-Equipment is not suitable for use in the presence of a flammable

anesthetic mixture with air or with oxygen or nitrous oxide.

7. Operating, storage and transportation environment of the device:

◆ Operating environment:

Temperature: +5 °C ~ +40 °C

Relative humidity range: 25% RH ~ 80% RH

Atmospheric pressure range: 860 hPa ~ 1060 hPa

Maximum altitude: 3 Km

◆ Storage and transportation environment:

Temperature: -40 °C ~ +55 °C

Relative humidity range: 25% RH ~ 93% RH

Atmospheric pressure range: 700 hPa ~ 1060 hPa

Maximum altitude: 3 Km

1.5.2. Biohazard Considerations

⚠WARNING⚠:

1. This device is not suitable for intracardiac use or direct cardiac contact.
2. For neonatal head imaging, EDAN recommends that you exercise special care during neonatal cephalic scanning to avoid possible damage to the posterior region of the eye. The ultrasound energy emitted by the transducer easily penetrates the fontanels of the infant.
3. EDAN makes every effort to manufacture safe and effective transducers. You must take all necessary precautions to eliminate the possibility of exposing patients, operators, or third parties to hazardous or infectious materials. These precautions should be considered in the use of any application that may indicate the need for such care, and during endocavity scanning; or when scanning patients with open wounds.

☣Ultrasound may be harmful to human body. This device should be used for valid reasons, for the shortest period of time, and at the lowest mechanical and thermal indices necessary to produce clinically acceptable images. According to the ALARA (As Low As Reasonably Achievable) principles, acoustic output should be set to the lowest level required to satisfactorily perform the examination. Long time exposure should be avoided. For the parameters of sound output, please refer to appendix A.

The DUS 3 complies with the requirements of applicable International Electrotechnical Commission (IEC) standards in terms of safety and acoustic output levels.

1.5.3. Electrical Safety

⚠WARNING⚠:

1. To ensure grounding reliability, only connect the system to a hospital-grade power receptacle.
2. The AC power connector plug for the ultrasound system is a three-prong grounded plug and should never be adapted to any two-prong (non-grounded) outlet, either by modifying the plug or by using an adapter.
3. To avoid electrical shock, never modify the ultrasound system's AC power circuits. To ensure grounding reliability, connect the system only to an equivalent outlet.
4. **SHOCK HAZARD-**Do not attempt to connect or disconnect a power cord with wet hands. Make certain that your hands are clean and dry before touching a power cord.
5. The equipment should be installed by a qualified service engineer. Do not try to access the interior of the main unit. Only authorized service personnel could remove the unit cover.
6. Before use, you must make sure that there is no visible evidence of damage on the equipment, cables and probes which may affect patient safety or diagnostic capability. The recommended inspection interval is once per week or less. If damage is evident, replacement is recommended before use.
7. Equipment connected to the DUS 3 and located in the patient zone must be powered from a medically-isolated power source or must be a medically-isolated device. Equipment powered from a non-isolated source can Cause your system to exceed leakage current limits. Enclosure leakage current created by an accessory or device connected to a non-isolated outlet may add to the enclosure leakage current of the imaging system.
8. Use an extension cord or multi-socket outlet setup to provide power to the ultrasound system or to the system's peripheral devices, may compromise the system grounding and cause your system to exceed leakage current limits.
9. To avoid electrical shock and damage to the system, turn off and disconnect the device from the AC power source before cleaning and disinfecting.
10. When more than one medical device is connected to the patient, leakage current of the devices is summed together. Take caution.
11. Don't touch the signal input or output connector and the patient simultaneously.
12. Periodically have the integrity of the system ground checked by a qualified service engineer.

CAUTION:

1. To avoid the possibility of electrostatic shock and damage to the system, avoid using aerosol spray cleaners on the monitor screens.
2. DO NOT use spray cleaners on the system, as this may force cleaning fluid into the system and damage electronic components. It is also possible for the solvent fumes to build up and form flammable gases or damage internal components.
3. DO NOT use any fluid onto the system surface, as fluid seepage into the electrical circuitry may cause excessive leakage current or system failure.
4. To ensure proper grounding and leakage current levels, it is the policy of EDAN to have an authorized EDAN representative or an EDAN approved third party perform all on-board connections of documentation and storage devices to the DUS 3.
5. The device and accessories are to be disposed of according to local regulations after their useful lives. Alternatively, they can be returned to the dealer or the manufacturer for recycling or proper disposal.

NOTE:

Please use the standard power cord as the input line of the network power supply for the adapter to reduce risk.

Electromagnetic Compatibility (EMC)

Operating the DUS 3 in close proximity to sources of strong electromagnetic fields, such as radio transmitter stations or similar installations may lead to interference visible on the monitor screen. However, the device has been designed and tested to withstand such interference and will not be permanently damaged.

EMI Limitations

Ultrasound machines are susceptible to Electromagnetic Interference (EMI) from radio frequencies, magnetic fields, and transients in the air of wiring. Ultrasound machines also generate EMI. The DUS 3 complies with limits as stated on the EMC label. However, there is no guarantee that interference will not occur in a particular installation.

Possible EMI sources should be identified before the unit is installed.

Electrical and electronic equipment may produce EMI unintentionally due to one of the following defects:

- High frequency electrotome
- Transformer
- Defibrillator
- Wireless LAN equipment
- Medical lasers
- Scanners

- Cauterizing guns
- Computers
- Monitors
- Fans
- Gel warmers
- Microwave ovens
- Light dimmers
- Portable phones

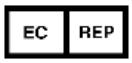
The presence of a broadcast station or broadcast van may also cause interference.

If you find strong interference shows on the screen, please check the sources.

1.6. Labeling Symbols

Descriptions of symbols of the device are shown as below.

Table 1-1 Descriptions of Symbols

No.	Symbol	Definition
1	SN	Serial Number
2	P/N	Part Number
3		Date of Manufacture
4		Manufacturer
5		Consult Instructions for Use
6		Symbol for “Caution, Consult Accompanying Documents”
7		Biological Risks
8		It indicates that the equipment should be sent to special agencies according to local regulations for separate collection after its useful life and that this equipment is put on the market after 13 August 2005.
9		General symbol for recovery / recyclable
10	Rx only (U.S.)	Federal (U.S.) law restricts this device to sale by or on the order of a physician.
11		Authorized Representative in the European Community
12	CE 0123	The symbol indicates that the device complies with the European Council Directive 93/42/EEC concerning medical devices.

13		Type B, Applied Part
14		Alternating Current (a.c.)
15		ON (AC power supply)
16		OFF (AC power supply)
17		Equipotentiality
18		VGA output, External Monitor
19		Fuse
20		Probe socket
21		Net work port
22		Foots witch To identify a foot switch or the connection for a foot switch.
23		Protective earth (ground)
24		Recording on an information carrier
25	EDAN	Trademark
26		USB (Universal Serial Bus) Connection
27		Dangerous voltage
28		Variability, for rotating movement Rotate clockwise to increase the value, and counterclockwise to decrease the value.
29		Variability Adjust right to increase the value, and left to decrease the value.

1.7. Electrical Safety Classifications

- According to **the type of protection against electric shock**:

  Equipment without internal power source,

  Class I equipment.

- According to **the degree of protection against electric shock**: Type B.
- According to **the degree of protection against harmful ingress of liquid**:

  IPX0, general equipment. But the probe can protect against splashing water, IPX4.

- According to **the degree of safety of application in the presence of a flammable gas**:

Equipment not suitable for use in the presence of a flammable gas.

- According to **the mode of operation**: Continuous operation.
- According to **the grade of EMC**: Group I，Class A

1.8. Standards Compliance

The DUS 3 is in compliance with the following standards.

Table 1-2 International Standards

Standard	**Description**
IEC 60601-1:1988+A1+A2 EN 60601-1:1990+A1+A2	Medical electrical equipment; Part 1: General requirements for safety
IEC/EN 60601-1-2:2001+A1	Medical electrical equipment-Part 1-2: General requirements for safety-Collateral standard: Electromagnetic compatibility -Requirements and tests
IEC/EN 60601-1-4	Medical electrical equipment - Part 1-4: General requirements for safety - Collateral standard: Programmable electrical medical systems
IEC/EN 60601-2-37	Medical electrical equipment-Part 2-37: Particular requirements for the safety of ultrasonic medical diagnostic and monitoring equipment
IEC/EN 61157	Requirements for the declaration of the acoustic output of medical diagnostic ultrasonic equipment

Chapter 2 System Overview

2.1. Appearance

2.1.1. Front Panel

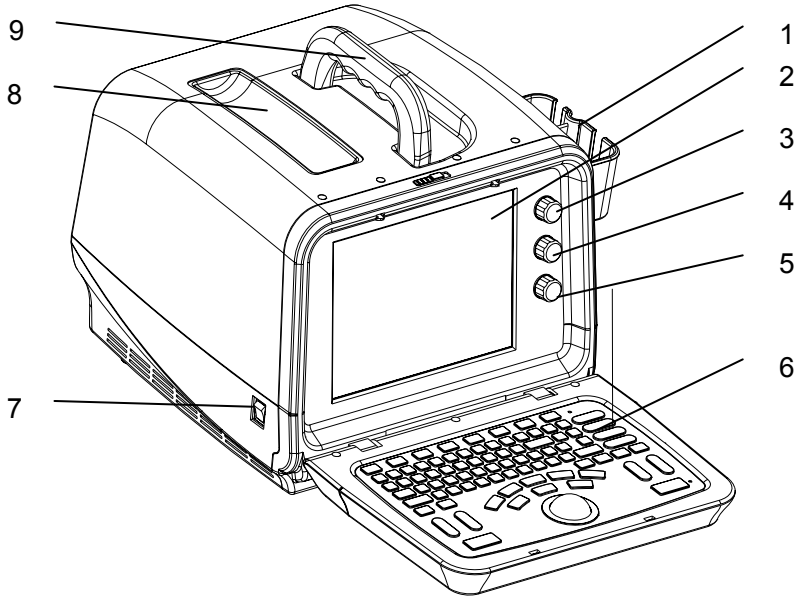


Figure 2-1 Front Panel Schematic Diagram

1 Probe holders

2 Display screen

3 Contrast adjustment knob

4 Brightness adjustment knob

5 Gain adjustment knob

6 Control panel

7 Power switch

8 Trough for the coupling gel

9 Grip

2.1.2. Rear Panel

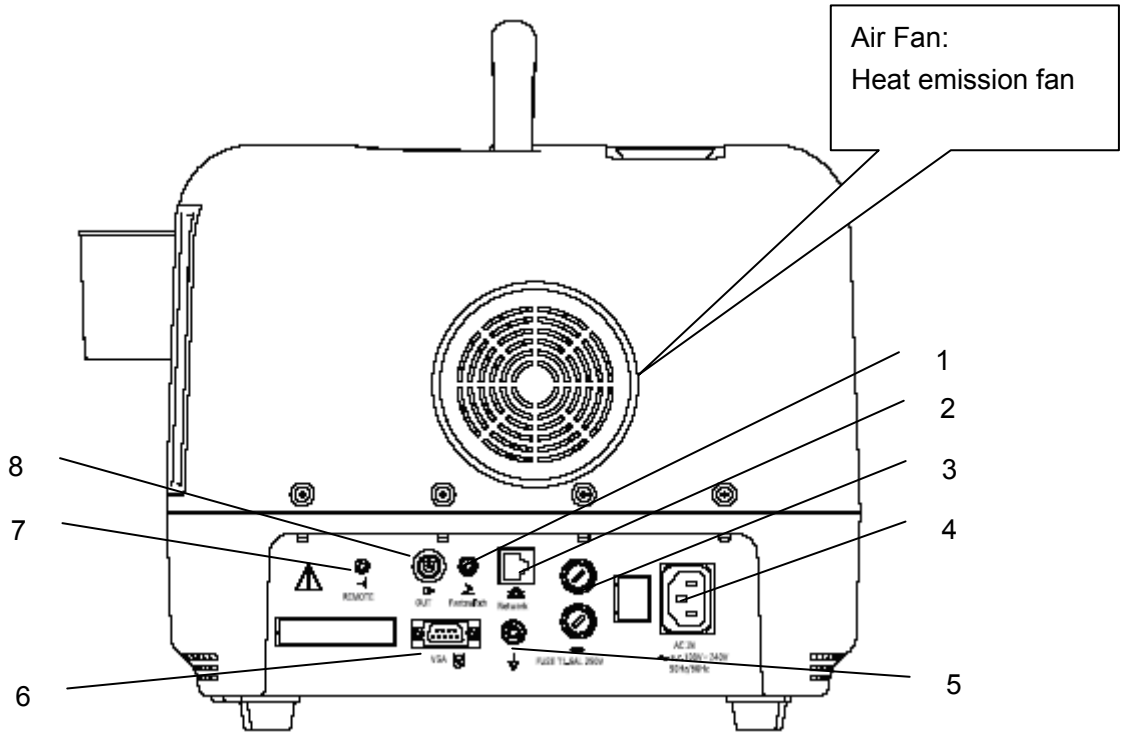


Figure 2-2 Rear Panel Schematic Diagram

1 Footswitch port

2 Network port

3 Fuse

4 Power supply input port

5 Equipotential earth terminal

6 VGA output port

7 Remote port

8 Video output port

CAUTION:

To have good aeration performance and being able to operate normally, please don't cover or plug the air fan or heat dissipation orifice partly or wholly by any object.

2.1.3. Right View (Dual Probe Sockets)

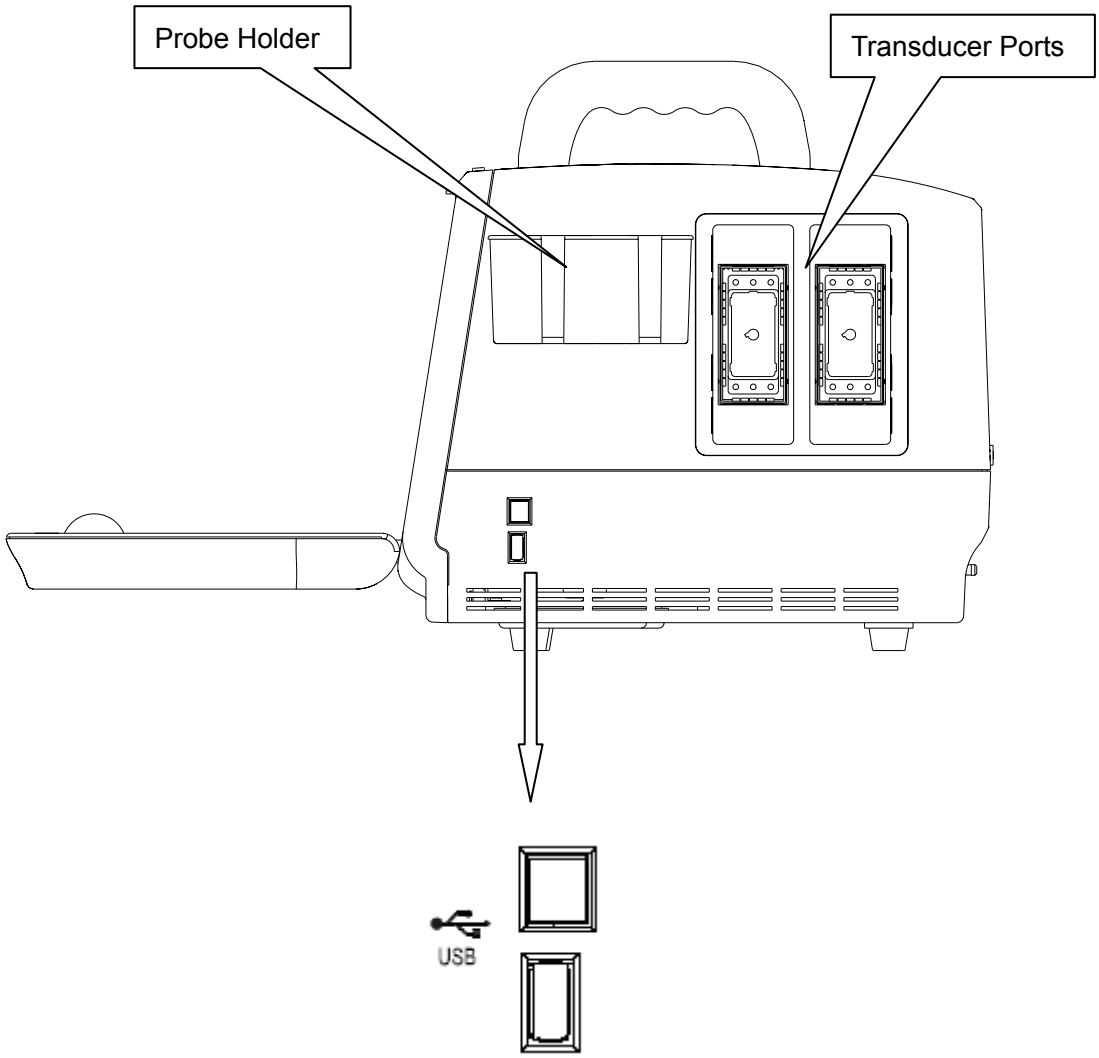


Figure 2-3 Right View Schematic Diagram

Peripheral port:

2 transducer ports (dual sockets)

2 USB ports

1 probe holder (for two probes)

2.2. Technical Specifications

2.2.1. Power Supply

Power supply: a.c. 100~240V, 50Hz/60Hz, 110VA

2.2.2. Machine Specifications

Main unit dimensions: 353 mm (W) × 315 mm (L) × 253 mm (H)

Packaging dimensions: 500 mm (W) × 460 mm (L) × 465 mm (H)

Net weight: 11.5 Kg

2.2.3. General Technical Specifications

Table2-1 General Technical Specifications

Model	**DUS 3**
Monitor	10-inch non-interlaced progressive scanning black and white monitor
Resolution	800×575 pixels
Display Modes	B, B+B, 4B, B+M, and M
Image Gray Scale	256 levels
Image Magnification	×1.0, ×1.2, ×1.4, ×1.6,×2.0, ×2.4,×3.0, ×4.0 in distance (real time)
Storage	JPEG: 1000 frames; or BMP: 128 frames; or CIN: 128 frames
Depth Shift	B, B+B, 4B, B+M, M-modes in real time, in increments of 10 mm
Frame Correlation Coefficient	8 levels to adjust (0~7), (B, B+B, 4B, B+M-modes, ineffective when freezing)
Image Conversion	Up/Down flip, Left/Right flip
Language Conversion	Chinese, English, French, Spanish, etc. (The language options varies with language software installed.)
Acoustic power	16 levels to adjust (0~15)
Dynamic range	30dB~90dB (in 4 dB increments)
Focus position	16 levels to adjust
Focus number	Max. 4
Software packages	Abdomen, obstetric, small parts, gynecology, orthopedics, cardiology, and urology

B-mode Measurement	Distance, circumference, area, volume, ratio, % stenosis, and angle
M-mode Measurement	Distance, time, slope, heart rate (2 cycles)
Annotations	Patient name, age, sex, time, date, hospital name, doctor name, comment (full-screen character editing)
Body Mark	> 80 types
USB port	USB 1.1

2.2.4. Probe Specifications

Supported probe type: convex, linear, micro-convex, endocavity (transvaginal, endorectal).

This device can detect the probe automatically.

The applications of the probes:

C361-1: Abdomen, Gynecology, Fetal / Obstetrics, and Pediatrics;

C341: Abdomen, Gynecology, Fetal / Obstetrics, and Pediatrics;

C321-1: Abdomen, Gynecology, Fetal / Obstetrics, Pediatrics and Cardiology;

E611-1 (Transvaginal / Transrectal): Gynecology, Fetal / Obstetrics, and Urology;

E741 (Transrectal): Rectum and the surrounding viscera, uterus, ovary and prostate;

L741: Small parts (galactophore, thyroid gland, prostate), Neonatal Cephalic, Peripheral Vascular, Musculo-skeletal (both Conventional and Superficial).

The probe specifications are as follows.

Table2-2 Probe Specifications

Specifications					
Probe	**Standard Probe**	**Optional Probe**			
	R60/3.5MHz convex array transducer	L43/7.5MHz High frequency linear array transducer, Endorectal transducer	R20/3.5MHz Micro-convex array transducer	R10/6.5MHz Endocavity transducer	R40/3.5MHz convex array transducer
	C361-1	L741, E741	C321-1	E611-1	C341
Central frequency	3.5 MHz	7.5 MHz	3.5 MHz	6.5 MHz	3.5 MHz
Length of probe cable	2200±50 mm				

2.3. Configuration

2.3.1. Standard Configuration

- 1 DUS 3 main unit
- 1 convex array transducer: C361-1 (2.5/3.5/5.0MHz)
- 1 power cord (European Standard)
- 1 earth wire
- 1 probe holder
- 2 pieces of fuse, φ5×20, T1.6AL/250V
- 1 bottle of coupling gel 250mL
- 1 user manual
- 2 packing list

2.3.2. Options

The Digital Ultrasonic Diagnostic Imaging System supports the following options:

(1) Transducers

- Convex array transducer C341 (2.5/3.5/5.0MHz);
- Linear array transducer L741 (6.0/8.0/10.0MHz);
- Endorecta transducer E741 (6.0/8.0/10.0MHz);
- Endocavity transducer E611-1 (5.0/6.5/8.0MHz);
- Micro-convex array transducer C321-1 (2.5/3.5/5.0MHz).

(2) Others

- Ultrasonic Imaging Management System software specifications

  Operating system: support WINDOWS 2000, WINDOWS XP, and WINDOWS VISTA.

  Software function: image gathering, storage and playback; patient data management; worksheet editing and printing, system analysis.

- Video printer and USB printer are shown below.

Table2-3 Printers

Options	**Recommended Models**
Video printer	SONY UP-895MD SONY UP-897MD

	MITSUBISHI P93W
USB printer	HP DeskJet D2368 (parallel port / USB 1.1) HP DeskJet D2468 (parallel port / USB 1.1) HP DeskJet D2568 (parallel port / USB 1.1) HP DeskJet D4368 (parallel port / USB 1.1) HP LaserJet P2015 (parallel port / USB 1.1)

The video printer output: 110 × 82 mm; The USB printer output: A4 paper, 210 × 297 mm.

◆ Puncture

Table2-4 Needle Guide Bracket Kit

Model	**Name**	**Description**
BGK-CR60	Needle Guide Bracket Kit	For the R60 probe, 4 vessels: 14G, 18G, 20G, 22G
BGK-CR40	Needle Guide Bracket Kit	For the R40 probe, 4 vessels: 14G, 18G, 20G, 22G
BGK-CR20	Needle Guide Bracket Kit	For the R20 probe, 4 vessels: 14G, 18G, 20G, 22G
BGK-CR10	Needle Guide Bracket Kit	For the R10 probe, 4 vessels: 14G, 18G, 20G, 22G
BGK-LA43	Needle Guide Bracket Kit	For the L43 probe, 4 vessels: 14G, 18G, 20G, 22G

The puncture frame of BGK-CR60 is shown below.

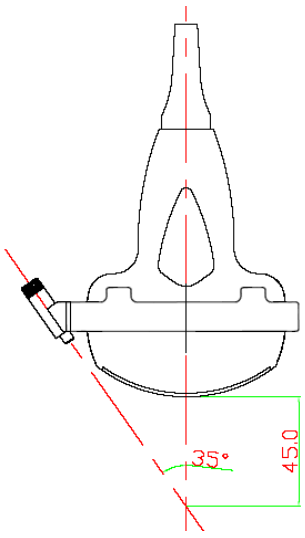


Figure 2-4 Puncture Frame of BGK-CR60

◆ DICOM 3.0

◆ Footswitch

Single-pedal footswitch

◆ MT-802 Mobile trolley

The mobile trolley has a compact and mobile console with four wheels and four brakes for safe and convenient transport.

It can be assembled or disassembled easily.

The external structure complies with usability engineering.

Two holders for the probes and one holder for the coupling gel.

MT-802 Trolley Assembling Instruction

- Hand carried bag

The bag is portable and it can be carried over the shoulder.

It can contain not only the main unit but also two probes (an array transducer R60/3.5MHz and an endocavity transducer R10/6.5MHz) and one bottle of coupling gel.

It is watertight.

Chapter 3 Transportation and Storage

3.1. Moving the System

Digital Ultrasonic Diagnostic Imaging System is designed to be portable and easily transported between sites. Power off the system and secure all accessories before moving it to another location.

⚠CAUTION⚠:

1. DO NOT park, or leave unattended, on a slope. Even when the wheel brakes are engaged, the system may slide down a ramp.
2. Switch off the ultrasound system. Unplug the power cord from the power source and secure the power cable.
3. Put the probes in the probe holder, or remove them and place them in the protective carrying cases.
4. Disconnect and secure the footswitch and the connecting cable.
5. Raise the brakes away from the front and back caster wheels.
6. Push the handle to roll the system forward and maneuver it to its new location and lock the wheel caster brakes.
7. Connect optional system accessories, such as the single-pedal footswitch.
8. Secure the system and complete the system setup, and then perform all the daily checklist items before using it.

3.2. Storage

- DO NOT place the device near the ground, walls or roof.
- Keep good indoor ventilation. Avoid strong and direct sunlight, and erosive gas.

3.3. Transportation

To prepare the system for shipment over long distance or rough terrain, repack the system in the factory packing and crate.

To prepare the system for transport over distances: load the system into a vehicle using a lift gate.

To prevent lateral movement of the system, secure the system with cargo straps. To prevent sudden jarring of the system during transport, provide shock cushions beneath the system.

It is suitable for transportation by air, railway, highway and ship. Avoid splashing with rain and snow, inversion, and collision.

Chapter 4 Installation Instructions

4.1. Environmental Requirements

Keep the device away from equipment with strong electric field, strong magnetic and high voltage field, and protect the display screen from direct exposure to strong sunlight. Keep good ventilation.

4.2. Unpacking Inspection

After unpacking the device, customers should follow the PACKING LIST to check the product carefully and to make sure that no damage has occurred during transportation. Then, install the device according to the installation requirement and method.

⚠**WARNING**⚠**:**

1. DO NOT use the device if it is found to be damaged or defective.
2. DO NOT drop or collide with the probe, otherwise you shall give up using it.

Note: there are two standby silica gel pads for the system. If necessary, stick them on the rear surface of the keyboard to avoid abrasion, as shown below.

4.3. Connecting Procedure

1. Take the main unit and accessories out of the package.
2. Connect the transducers to the main unit correctly.

3. Connect the printer and load the recording paper.
4. Connect the power cable

   1) Connect the earth wire between the main unit and the common grounding terminal firmly.

   2) Plug one end of the power cable to the power socket of the main unit, the other end to the special power output socket of the hospital.
5. Switch on the main unit.

   Press the power switch on the left side of the panel. You can operate the main unit after the main interface appears.

4.3.1. Connecting or Disconnecting Transducers

NOTE:

Ensure that the system is shut down before connecting and disconnecting transducers.

Flip images horizontally to change the scan direction or vertically to change the image orientation. The scan direction mark located at the side of probe indicates the beginning direction of scanning. The scan direction mark is as shown below.

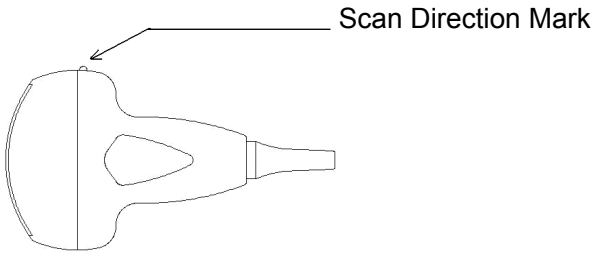


Figure 4-1 Probe Scan Direction Mark Schematic Diagram

There is information about Model and SN on the probe.

To connect a transducer:

1. Place the transducer's carrying case on a stable surface and open the case.
2. Carefully remove the transducer and unwrap the probe cable.
3. DO NOT allow the transducer head to hang free. Impact to the transducer head could result in irreparable damage.
4. Turn the connector locking handle to the **OPEN** position.
5. Align the connector with the transducer port and carefully push into place.
6. Turn the locking handle on the transducer connector clockwise to the **LOCK** position. This ensures the connector in position and ensures the best possible contact.
7. Place the transducer in the transducer holder.

To disconnect a transducer:

1. Turn the locking handle on the connector housing counterclockwise to the **OPEN** position.
2. Firmly grasp the transducer connector and carefully remove it from the system port.
3. Store each transducer in its protective carrying case.

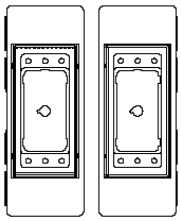
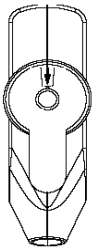
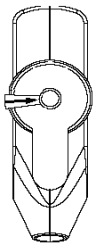


Figure 4-2 Transducer Ports



Locked



Unlocked

Figure 4-3 Locked and Unlocked Positions of the Probe Connectors

⚠WARNING⚠:

DO NOT touch the pin of probe connector.

⚠CAUTION⚠:

DO NOT plug or pull out the connector when the device is activated. This is to avoid uncontrollable damage to the probe and the main unit.

NOTE:

Once the probe is connected to the main unit, please do not reinstall it frequently. This is to avoid poor contact between the probe and the main unit.

4.3.2. Rear Panel Connections

Video connections are located on the rear panel of the DUS 3.

⚠WARNING⚠:

Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC/EN standards (e.g. IEC/EN 60950 for data processing equipment and IEC/EN 60601-1 for medical equipment). Furthermore, all configurations shall comply with the valid version of the standard IEC/EN 60601-1-1. Therefore, anybody, who connects additional equipment to the signal input or output connector to configure a medical system, must make sure that it complies with the requirements of the valid version of the system standard IEC/EN 60601-1-1. If in doubt, consult our technical service department or your local distributor.

CAUTION:

To ensure proper grounding and leakage current levels, it is the policy of EDAN to have an authorized EDAN representative or EDAN approved third party perform all on-board connections of documentation and storage devices to the DUS 3.

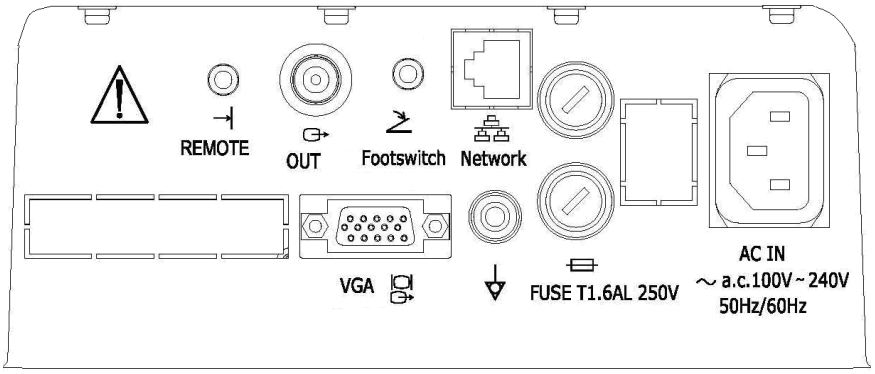


Figure 4-4 Rear Panel Connections

Peripheral port:

1 remote port	1 Network port (DICOM 3.0)
1 video output port	1 power supply input port
1 foot switch port	2 fuses, φ5×20, T1.6AL/250V
1 VGA output port (15 pin)	1 equipotential earth terminal

Equipotential Bonding

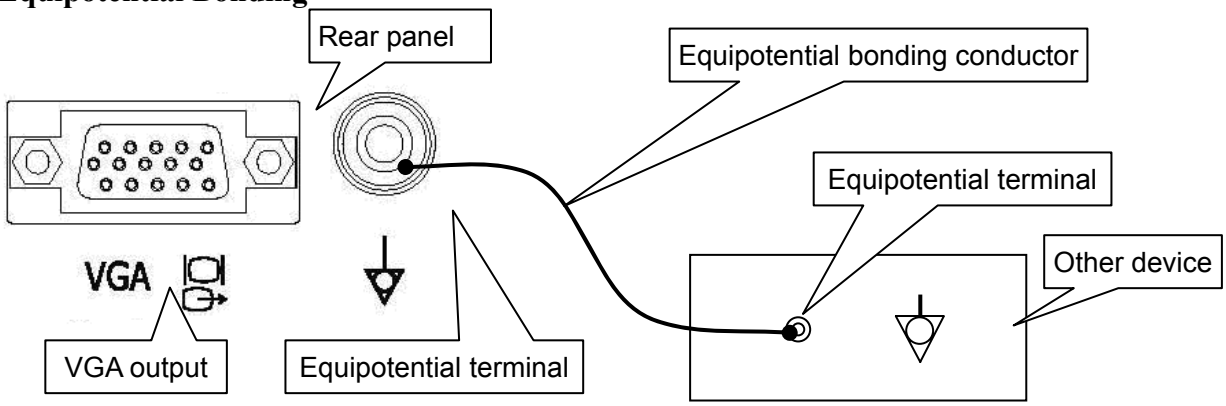


Figure 4-5 Equipotential Bonding

Any use of other devices with the system is at the user's risk and may void the system warranty. In order to fulfill IEC/EN 60601-1-1 requirements, connections of peripheral equipment to the DUS 3 must adhere to one of the following conditions:

- The peripheral equipment itself is a medical device approved according to IEC/EN 60601-1.
- Non-medical peripheral equipment approved according to any other EN or IEC standard must use the following setup for connection:

-Connect the DUS 3 to an independent protective earth terminal with an earth wire connection to the ultrasound system's Equipotential Connector. Ensure that the protective earth wire is connected to a qualified protective earth connection independent of the existing system's earth connection (via the power cable).

-The peripheral equipment is located at least 1.5 meters (1.8 meters in Canada and the U.S.A) outside the patient environment. A patient environment is defined as the area in which medical examination, monitoring, or treatment of the patient takes place.

-The peripheral equipment is connected to a main outlet outside the patient environment but still within the same room as the ultrasound system.

⚠WARNING⚠:

1. Equipotential bonding: When the device is running with other instruments jointly, consideration should be given to equipotentiality.
2. Doctors and patients might be exposed to the hazardous and uncontrollable effects of compensating current caused by unbalanced equipotentiality between indoor medical device and touchable conducting parts. The safest solution is to build a unified equipotential network, to which the medical device is connected, using an angular plug.

Printer Installation

This system supports video printer and USB printer.

◆ To install the video printer:

1. Power off the main unit and the printer.
2. Connect the VIDEO IN (video input) of the video printer with the VIDEO OUT (video output) of the main unit.
3. Connect the REMOTE of the video printer with the REMOTE of the main unit.
4. Power on the main unit and run the printer.

◆ To install the USB printer:

1. Power off the main unit and the printer.
2. Connect the printer with the main unit by using a USB cable.
3. Power on the main unit and run the printer.

Reference

1. Figure 2-2 Rear Panel Diagram.
2. Chapter 5.7.3, General Presetting.

If the printer can not work normally, check the printer presetting.

NOTE:

If you want to use the multiple portable socket-outlet to supply power to the whole DUS 3 system, you are suggested to calculate the system power consumption when building a DUS 3 system so as to match the system power consumption with the power sustained by the Multiple portable socket-outlet.

Chapter 5 System Control

5.1. Powering the Device

◆ To power on the device

Before powering on this device, check as below:

1. Check all the cables and make sure there is no scrape or crack.
2. Check the control panel and the monitor and make sure there is no crack.
3. Check the probe and the connection and make sure there is no scrape or crack.
4. Check the power socket and the switch and make sure there is no damage.

To power on:

1. Connect one end of power cable at the rear panel of the device, and the other end to the standard three-pin power supply socket.
2. Switch on, and then the power indicating light on the panel is on, and a startup interface appears.

◆ To shut down the device:

After using it, switch off power supply. The power indicating light on the panel is off.

NOTE:

Please unplug the AC power cord from the power socket if the device is to remain idle for a long time.

CAUTION:

1. You are forbidden to unplug or plug the power cord before switching off the system.
2. Wait approximately five seconds between powering the system off and then on again. This allows the system to complete its shutdown sequence.

◆ To restart the device:

If there is any trouble described as below, please switch off the device and then power on the device to restart.

1. The device displays wrong information and it lasts a long time.
2. The device displays abnormally.
3. The device can not execute an operation.

5.2. Examining

Apply an appropriate amount of coupling gel (medical ultrasound coupling agent) to the body area to be examined, and then contact the area with the acoustic window of the probe firmly. A cross-sectional image of tissues is displayed on the screen. Adjust the **brightness, contrast, gain, TGC, acoustic output, dynamic range, and focus combination** properly. Adjusting the monitor's contrast and brightness is one of the most important factors for proper image quality. If theses controls are set incorrectly, the **gain, TGC, dynamic range, focus combination and even acoustic output** may have to be changed more often than necessary to compensate. Meanwhile, properly move the probe to obtain an optimal image of the target area. Or if necessary, adjust **sweeping speed** to get satisfying images in the M-mode.

CAUTION:

1. Please be gentle when contacting the target area with a probe. This is to avoid making the probe damaged or the patient disturbed.
2. Please choose a proper probe for the target area with an appropriate frequency to begin the diagnostic operation.
3. Adjust the total gain (Gain) knob slowly.

5.3. Screen Layout

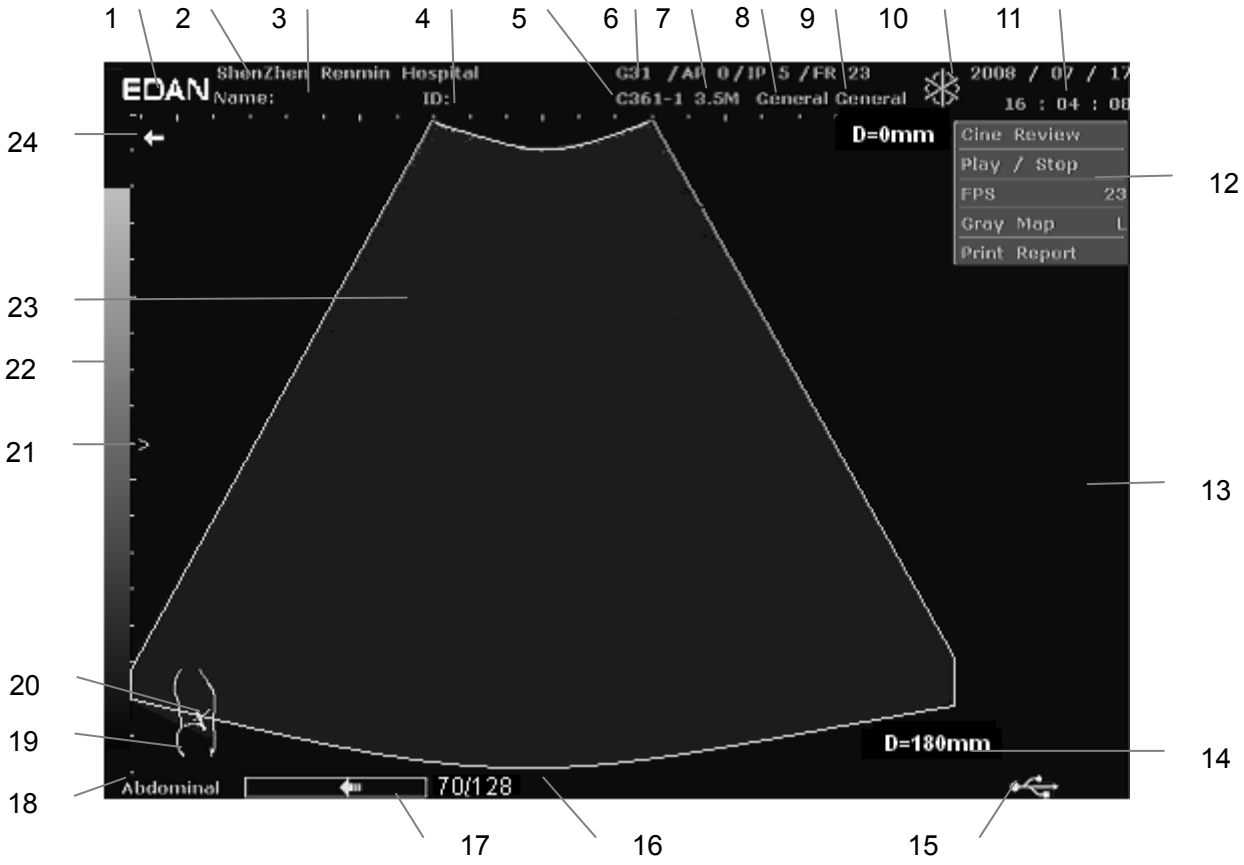


Figure 5-1 Typical Image Screen

1 Manufacturer logo

2 Hospital name

3 Patient name

4 Patient ID

5 Type of current probe

6 G, AP, IP, FR

7 Transmitting frequency

8 TSI

9 THI

10 The freeze symbol

11 Time and date

12 Menu window

13 Measured Results window

14 Depth of current image

15 The USB connecting symbol

16 Operation prompt instruction window

17 The cine review symbol

18 Examination type

19 Body mark

20 Probe symbol

21 Focus (Current Focus Position and Number)

22 Gray bar

23 Image window

24 Probe direction

5.4. Control Panel

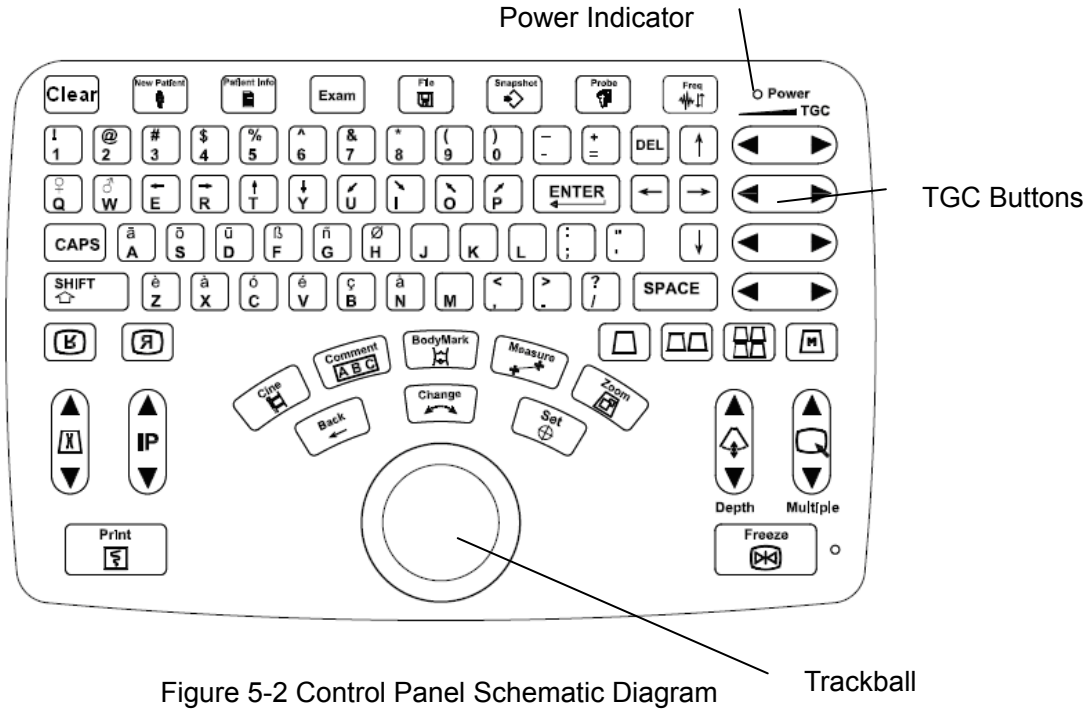


Figure 5-2 Control Panel Schematic Diagram

5.4.1. Trackball

The trackball is easy and convenient to operate. It can achieve the following functions:

- Move the measurement cursor during measurement.
- Move to select menu items in menu-based operations.
- Move the comment cursor in the comment status.
- Move the M Mark in the B/M-mode.
- Realize single frame playback in the frame-by-frame playback status.
- Move the zoomed window in the zoom status.

NOTE:

1. Please be gentle when running the trackball.
2. Please keep the surface of trackball clean.

5.4.2. “0~9” Numeric Keys

Numbers are used for calibrating time, data settings, age notation, and comment adding etc.

5.4.3. Alphabetic Keys

The system supports some language-specific characters through the use of SHIFT with a combination of keys on the keyboard. Press any of these keys in the annotation mode and comment mode to display the corresponding character on the cursor position.

Table 5-1 German and French Characters

German Characters

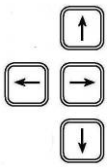
Symbol	Key Combination
ä	SHIFT-A
ö	SHIFT-S
ü	SHIFT-D
β	SHIFT-F
ñ	SHIFT-G
ø	SHIFT-H

French Characters

Symbol	Key Combination
è	SHIFT-Z
à	SHIFT-X
ó	SHIFT-C
é	SHIFT-V
ç	SHIFT-B
å	SHIFT-N

5.4.4. Function Controls

Table 5-2 Function Controls

Key	Description
	Space key Press this key in the annotation mode and comment mode to introduce a blank space on the cursor position.
+ Alphabetic key combination Press **SHIFT** and alphabetic key corresponding language's special character.	
	Alphabetic Shift key It is used to switch the characters between lowercase and uppercase.
	Entering key In annotation mode and comment mode, press this key to move the cursor to insert a blank line.
	Delete key In annotation mode and comment mode, press this key to delete text word by word.
	Arrow key In annotation mode and comment mode, press these arrow keys to move the comment cursor.
	Press it to clear all the measurements, calculations, comments, or body marks on the screen.
	New Patient key Press this key to cancel all the recent patient data, comment, measurement, calculation and worksheet, except saved images.

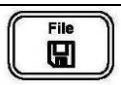
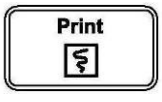
	Patient information annotation key Press this key to open or to close the Patient Data Input Dialog box.
	Examine Menu key Press this key to display or to exit the examination type menu.
	System Control key Press this key to enter or to exit the file management system; Reference Chapter 6.8, File Management. Or to do the presetting. Reference Chapter 5.7, Preset. When entering the file menu, you can not use other function keys.
	Snapshot key Press this key to save the current image. But after entering the file menu, you can't use this to save the current image. Reference Chapter 6.8.1, Saving Images.
	Probe Switch key Diverse probes are available for this device. Press this key to select a proper type of connected probe with the corresponding information in the top right corner. Reference Figure 5-1 Typical Image Screen.
	Frequency Shift Key Press this key to switch to the proper operating frequency for the activated probe. When you change the frequency, the G changes simultaneously.
	Image up/down Flip key Press this key to flip the image vertically.

	Image left/right Flip key Press this key to flip the image horizontally.
	Cine key Press this key to enter or exit the frame-by-frame cine mode.
	Comment key Press this key to activate or exit the annotation function.
	Body Mark Key Press this key to activate or exit the body mark function. It is to indicate the examine position and the scan direction.
	Measure key Press this key to activate or exit the measurement function.
	In the real-time status, press this key to activate a zoom window in the middle of the image, you can move it to the desired area with the trackball and adjust magnification of the zoom window by pressing **Multiple**. Then press **Set** to display the zoomed image, and then roll the trackball to move the zoomed image
	Back key In the measurement status, press this key to return to previous operation. In comment mode, press the key to delete the entered text one by one. In parameter setting status, press the key to decrease the parameter value.
	Change This key has dual functions. In measuring status, you can press **Change** once to change the settled point and the active point. In annotation status, press this key to display the comment library.
	Set key Press this key to confirm the selection of a specific function or command. Use this to anchor calipers, select a menu item or image graphics. Or press it to increase the parameter value in the parameter setting status.
	Freeze key Press this key to switch between the frozen and real-time states. When an image is frozen, the system inserts " ❄ " next to the system time clock and the clock pauses. When unfreezing the system, all the measurements, calculations, body marks, and comments are erased.
	Print key Press this key to do the video printing.
/	Footswitch Pedaling on the footswitch is equivalent to pressing **Freeze**.

Comment function

The comment library is for positions and anatomical structures.

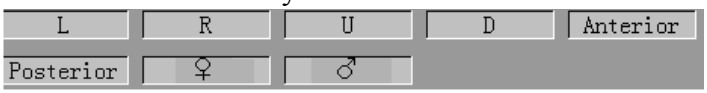
To activate the comment function:

Press **Comment**, and there is a cursor "l" displayed in the image area for annotating by the following ways:

Enter text directly onto the image using the keyboard.

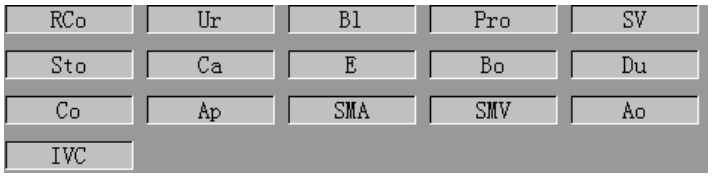
Insert system-defined or user-defined comment phrases by pressing **Change** to display the comment library.

During commenting, you can use **Delete** to cancel the undesired text word by word, or you can use **Back** to cancel the undesired text one by one.

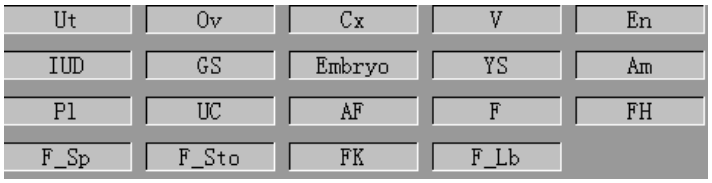


Generic

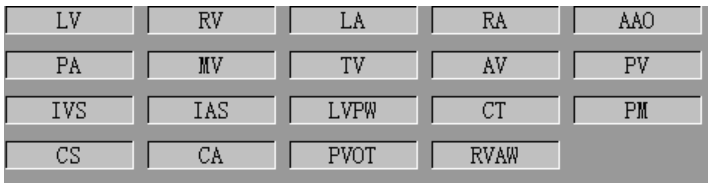
Abd 1



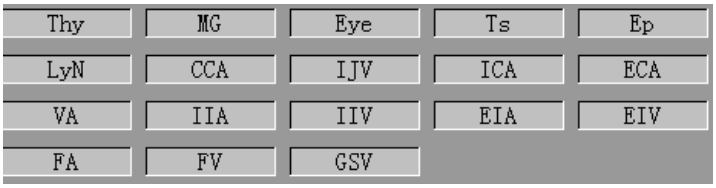
Abd 2



OB

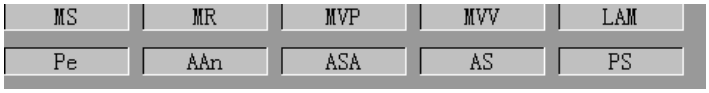


Cardiac



Sml

Lesion 1



Lesion 2

Figure 5-3 System-defined Comment Library

Body mark adding function

To activate the body mark adding function:

Press **Body Mark**, and the system displays the body mark dialog box. You can choose a type of body mark and press **Set** to add it, or press **Close** to close the dialog box to give up adding a body mark.

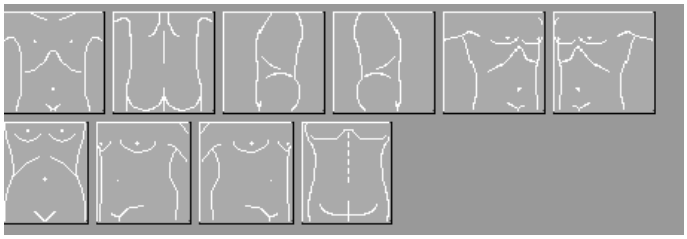
The selected body marks are displayed in the bottom left corner of the screen.

Reference

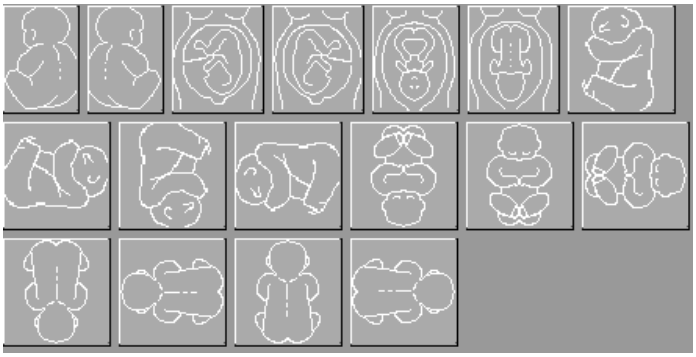
Figure 5-1 Typical Image Screen.

After adding a body mark, you can use the trackball to move the position of the probe, and you can also use the rotation function to change the direction of the probe.

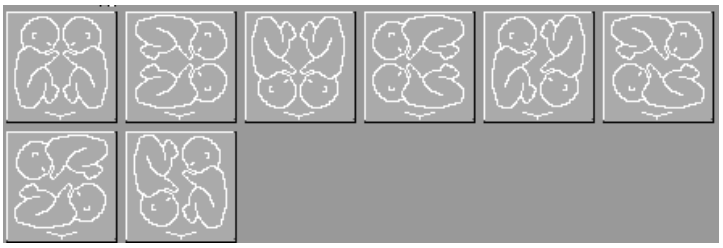
There are more than 80 types of body marks, as shown below:



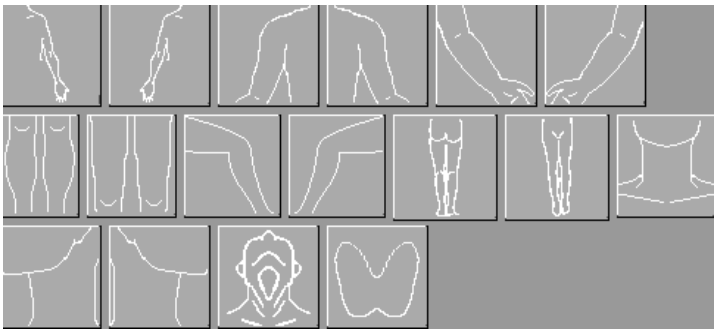
Abdomen



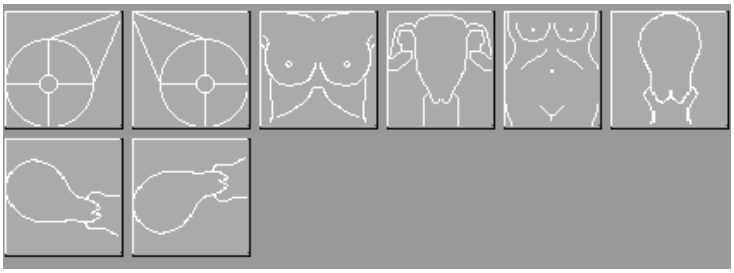
Obstetric



Twins

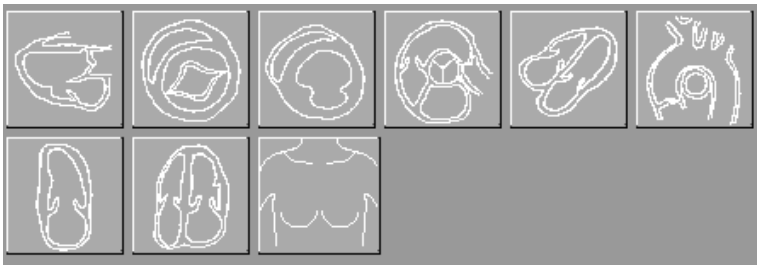


Small parts

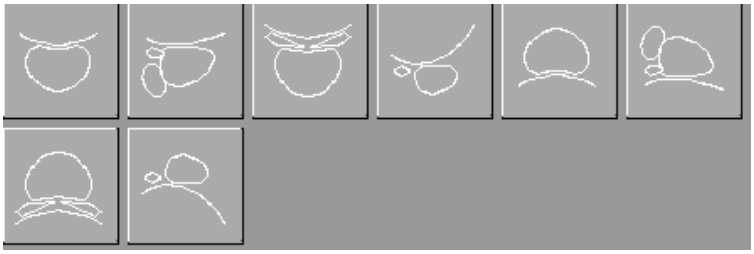


Gynecology

Orthopedics



Cardiology



Urology

Figure 5-4 Body Marks

5.4.5. Adjustment Controls

Focus Position adjustment button

Press the button to switch the position of the current focus. 16 segments of the adjustable electronic focus are provided by the device. By adjusting the focal point, a clear image can be obtained. The current focal point is as shown in the FOCUS position on the left of the screen.

Image Processing adjustment button

Press the button to do the image processing that has 8 levels, ranging from 0 to 7.

Depth adjustment button

Press this button to adjust the scanning depth, in increments of 10 mm. The current depth is displayed in the bottom right corner of the image.

Multiple function button

This button has three functions:

- In the zoom status, press this button to adjust the magnification, 1.0, 1.2, 1.4, 1.6, 2.0, 2.4, 3.0 or 4.0.
- When a body mark is added, the rotation function is automatically activated. You can press this button to adjust the scanning direction.
- When an arrow is added (press **Comment** to activate the comment function, and then press **Set** to add an arrow), the rotation function is automatically activated. You can press this button to adjust the arrow direction.

Adjustment knobs near the screen:

- Contrast: rotate this knob to adjust the contrast.
- Brightness: rotate this knob to adjust the brightness.
- Gain: rotate this knob to adjust the total gain (overall gain), 0 ~ 98, in increments of 2.

Time Gain Compensation (TGC) buttons:

Press the buttons to adjust the TGC. Press the upper buttons to adjust the near field gain, and the lower buttons to adjust the far field gain; press the right buttons to increase TGC, and press the left buttons to decrease TGC.

The system displays a graphics representing the TGC curve on the image screen, as shown below.

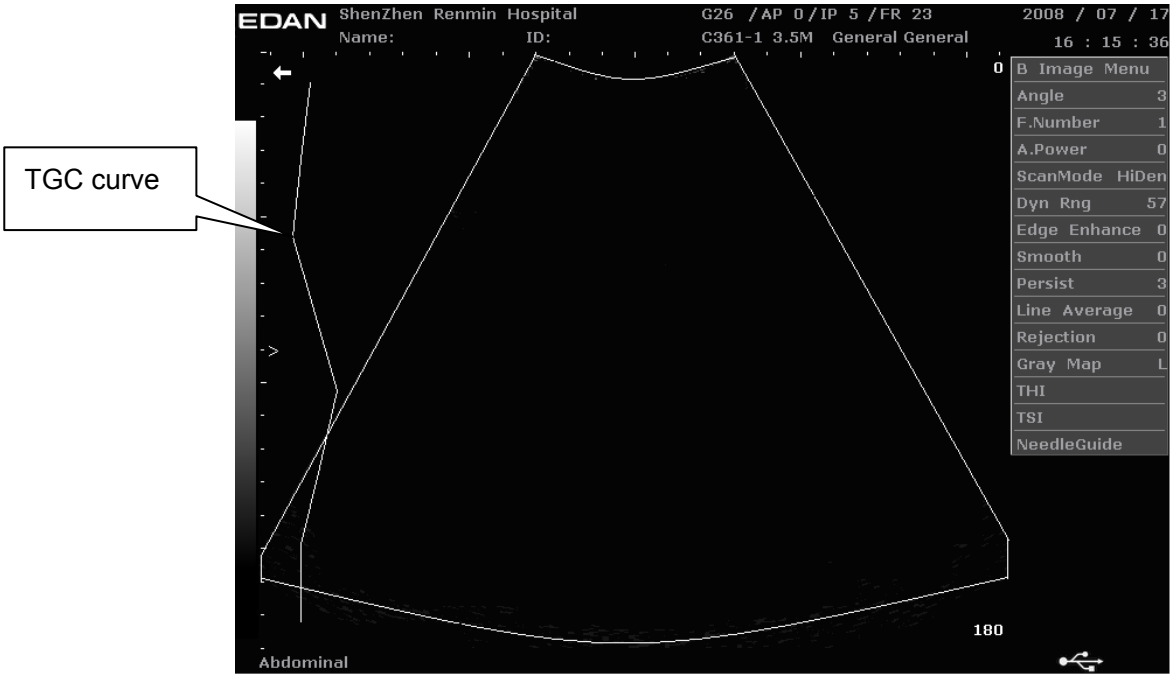
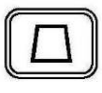


Figure 5-5 TGC Curve

5.4.6. Imaging Functions



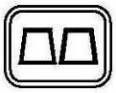
B-mode Imaging Control

Press this key to enter the **B-mode**. The system displays a single real-time **B-mode** image.
B indicates brightness, or two-dimensional (2D) gray scale imaging.
To access B-mode from another imaging mode:
Press the B control, and the system displays a single real-time B-mode image.

NOTE:

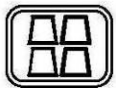
To return to a real-time B-mode image from any imaging mode, press the B control. This also deletes all measurements, calculations, comments, and body marks that are displayed on the screen.

To exit B-mode, press any other mode control.

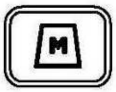
 **2B-mode Imaging Control**

This key has two functions:

- Press this key to enter the **2B-mode**.
- Press this key to active one of the dual images. The probe direction of the activated image is brighter than that of the frozen image.

 **4B-mode Imaging Control**

- Press this key to enter the **4B-mode**. The system divides the image area into four quadrants: the first quadrant is on the top left, the second on the top right, the third on the bottom left, and the fourth on the bottom right.
- Press it repeatedly to active one of the four images. The probe direction of the activated image is brighter than the direction of the frozen images. The four images are obtained respectively and only one image at a time is displayed in real-time.

 **B/M-mode and M-mode Display Control**

Press to cycle among the B/M mode or the M mode.

Press it once to enter B/M mode, the B mode and M mode images are displayed on the screen at the same time（Abbreviated as **B/M** or **B+M**）.The left image is a real-time image of B mode, while the right image is a real-time image of M mode. There is a line constituted by points with regular spacing on **B-mode** image, which is called the M Mark. Roll the trackball to move the M Mark. Press **Set** to locate the M Mark.

Press a second time to enter the M mode. It displays an M-mode sweep. The slope of this mode has four levels: 3, 6, 15 and 25 seconds.

5.4.7. Additional Control Functions

The DUS 3 also provides the following additional control functions, which are available through status menus.

Table 5-3 Additional Control Functions

Control function	Description
Angle (sector angle/ scan width)	Adjusts the sector angle for curve transducers, and the scan width for linear transducers.
F. Number	Adjusts the focus number.
A. Power	Adjusts the acoustic power.
Scan Mode	Selects the scan mode, High density or High FPS (frame rate, in frames per second)
Dynamic Range	Controls the overall contrast resolution of B-mode and M-mode images.
Edge Enhance	Improves the contour enhancement of the image for distinguishing the edges of a structure in B-mode.
Smooth	Adjusts the smooth level.
Persist	Selects the number of frames for frame averaging.
Line Average	Adjusts the line average level.
Rejection	Adjusts the rejection level.
Gray Map	Selects the post-processing gray curve map.
THI	Selects the THI type, tissue harmonic imaging / general.
TSI	Selects the TSI type, general/muscle/fatty/fluid.
M Sweep	Adjusts the scrolling speed level of the M-mode sweep.
M Mark	Adjusts the M Mark of the B/M mode.

These functions can be set using **Set** and **Back**.

5.5. Menu

Menus are displayed on the right of the screen. Only one menu can be activated at a time. The types are as shown below:

System status menu

In **B-mode** or **B/M-mode**, the system status menu provides information about the current imaging mode. In 2B and 4**B-mode**, it indicates the status and parameters of the active image. In **M-mode**, it indicates the status and parameters of M sweep. The following are the system status menus of B-mode, B/M-mode, and M-mode respectively.

Figure 5-6 System Status Menu

Measurement and calculation menu

Executes an operation. For instance, begin a distance measurement, and then the corresponding measurement cursor is displayed. The following is the B-mode generic measurement and calculation menu.

After entering B-mode, press **Measure** to display the menu below.

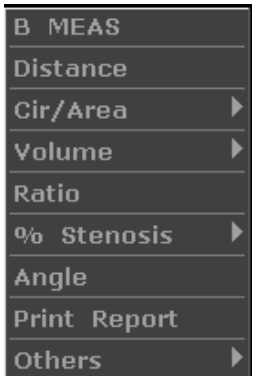


Figure 5-7 B Mode Generic Measurement and Calculation Menu

Secondary menu

The symbol "►" indicates that there is a secondary menu associated with the menu option. Roll the trackball to highlight the menu option with "►", the system displays a secondary menu for the selected option.

Example: The secondary menu of **Cir/Area** contains **Ellipse** and **Trace**, as shown below.

After entering B-mode, press **Measure** to display the menu below, and highlight the option **Cir/Area**, the system displays the secondary menu **Ellipse** and **Trace**.

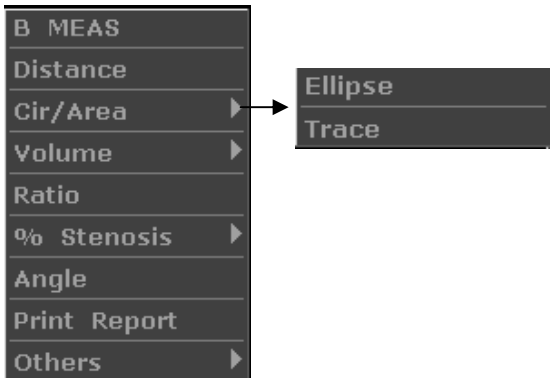


Figure 5-8 Secondary Menu

File menu

Figure 5-9 File Menu

Needle guide menu

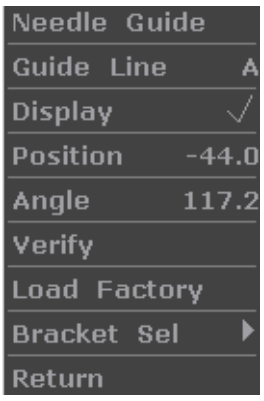


Figure 5-10 Needle Guide Menu

5.6. Dialog Box Operation

The dialog box may have a few tabs, as shown below. You can select one tab at a time with trackball and **Set**. Also, you can modify the parameter following the prompt instruction, and then highlight **OK** and press **Set** to save the modified parameters and close the dialog box; or highlight **Cancel** to give up the modification and close the dialog box directly.

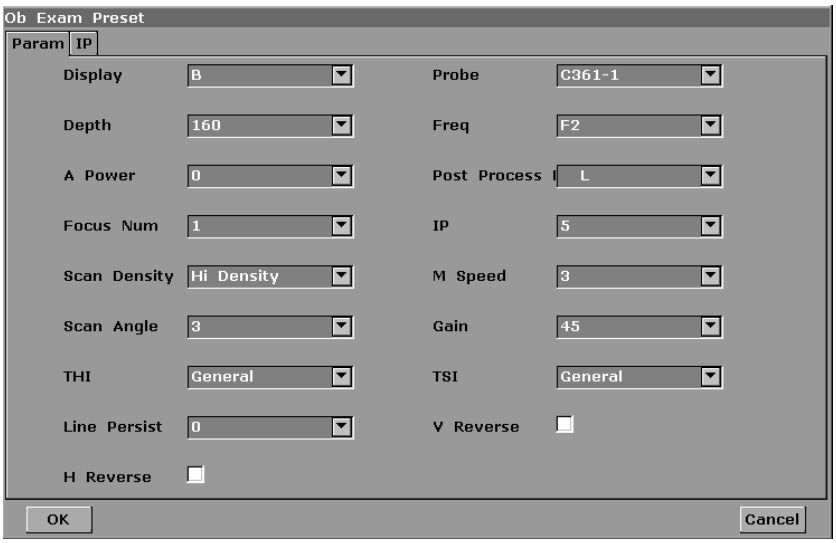


Figure 5-11 Obstetric Examination Preset Dialog Box

5.7. Presetting

5.7.1. Entering and Exiting

Enter presetting:

1. Press **File**, highlight **Preset**, and then press **Set** to display the preset menu, as shown below.

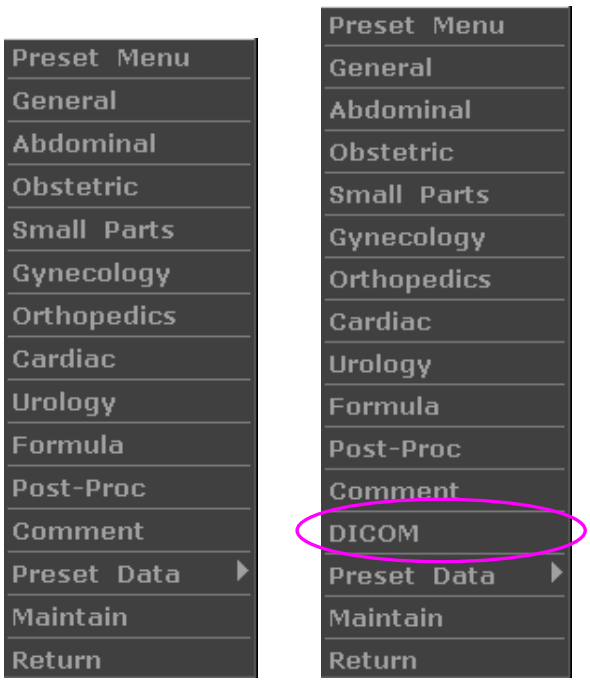


Figure 5-12 Preset Menu (the left—with no DICOM installed, and the right—with DICOM installed)

2. Roll the trackball to highlight one of the options and then press **Set** to display the menu of the corresponding option.

To exit presetting:

Highlight **Return** and press **Set**. Then the system restarts automatically. The system runs with the new modified parameters after being restarted.

5.7.2. Displaying / Modifying the Preset Parameter

Select a type of presetting and press **Set** to display the corresponding dialog box, and you can modify the parameter following the prompt instruction.

Reference

Chapter 5.6, Dialog box operation.

5.7.3. General Presetting

1. In preset menu, move the cursor to highlight **General** and press **Set** to display general presetting dialog box, as shown below.
2. Roll the trackball to highlight an item and then press **Set**. Then use the keyboard to enter text.

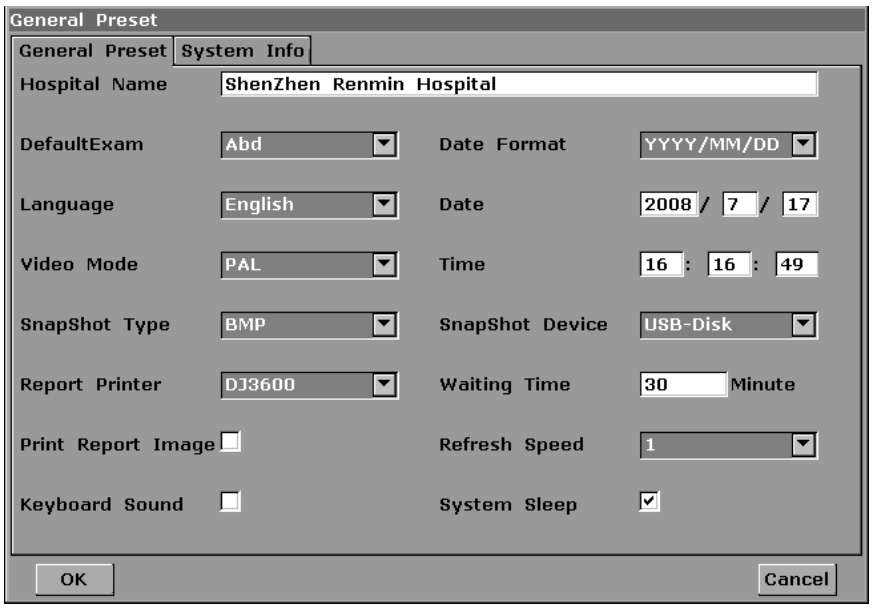
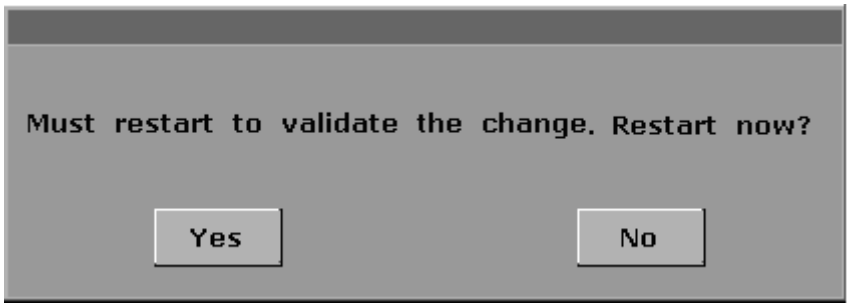


Figure 5-13 General Presetting

Table 5-4 General Presetting Information

Item	Setting	Allows you to
Hospital Name	Input freely	Set hospital name displayed on the top left of the screen and diagnosis report, with a maximum of 32 characters.
Default Exam	Abdomen, obstetric, small parts, gynecology, urology. orthopedics, or cardiology.	Preset the examination type.
Language	Chinese, English, French, Spanish, etc.（The language options varies with language software installed.）	Set the overlay language
Video Mode	PAL	Set video mode.
SnapShot Type	BMP/JPG	Set the snap shot type.
Keyboard Sound	√ / Null	Turn on or off the keyboard sound.
Report Printer	Report printer	Select the printer type.
Print Report Image	Select whether to print image in report.	Select whether to print image in report when printing by USB printer.
Date Format	Set freely	YYYY/MM/DD, MM/DD/YYY or DD/MM/YYYY.
Date	Set freely	Set the system date.
Time	Set freely	Set the system time, format: H/M/S.
SnapShot Device	USB-Disk/Fixed	Set the snap shot device.
System Sleep	√ / Null	Select whether the device enters sleep mode when no operation is done for certain minutes.
Waiting time	Set freely	Set the system waiting time to enter sleep mode (5-60 min).
Refresh Speed	1~10	Set the grade of glint speed of system dormancy.

You must restart the system to validate the change, including **Language**, **Video Mode**, **Keyboard Sound**, and **Report Printer**. After you perform those presets, and press **Return**, the system pops up a dialog box to prompt you whether to restart the system, as shown below.



5.7.4. Presetting Exam

Examination types include abdomen, obstetric, small parts, gynecology, orthopedics, cardiology, and urology. Take obstetric examination preset for example, in the preset menu, move the cursor to highlight **Obstetric** and press **Set** to display obstetric examination presetting dialog box.

Parameter Tab

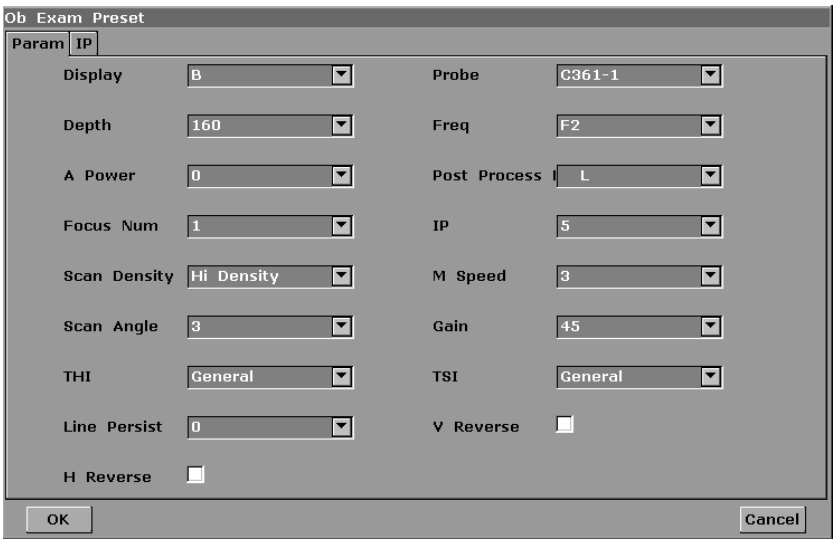


Figure 5-14 Obstetric Presetting -- Parameter Tab

Table 5-5 Obstetric Presetting Information – Parameter

Item	Setting	Allows you to
Display	B, M, B+B, 4B, B+M	Set display mode type.
Depth	40~240 mm (C361-1)	Set examine depth.
A Power	0~15	Set acoustic power, 16 levels.
Focuses Num	1/2/3/4	Set the number of focuses.
Scan Density	High density/high frequency	Set scanning density.
Scan Angle	0/1/2/3	Set scanning angle.
THI	Tissue harmonic imaging / General	Set THI.
Line Persist	0~7	Set image line correlation.
H Reverse	√ / Null	Set the attribute of Horizontal reversal.
Probe	Display all the probe type this device supports	Set the probe type to use.
Freq	F1/F2/F3	Set the frequency of probe.
Post Process	Gray map (L, A, B, C, D, S)	Select a default gray map.
IP	0~7	Set the image parameter.
M speed	1/2/3/4	Set the M-mode sweeping speed.
Gain	0~98	Set the gain of image, in 2 increments.
TSI	General/muscle/fatty/fluid	Set the type of TSI.
V Reverse	√ / Null	Set the attribute of Vertical reversal.

IP Tab

NOTE: IP----Image Parameter

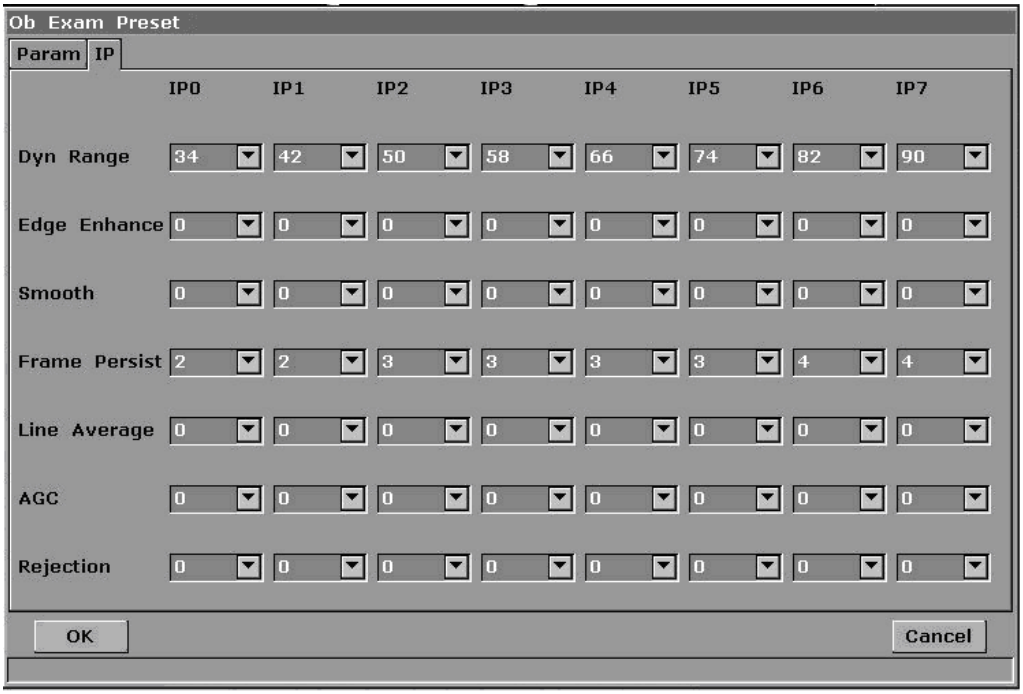


Figure 5-15 Obstetric Presetting -- IP Tab

Table 5-6 Obstetric Presetting Information – IP

Item	Setting	Allows you to
Dynamic Range	30~90 dB	Select the default dynamic range for the examination, in decibels (dB). During imaging, the dynamic range can be adjusted in 4 dB increments to the image.
Edge Enhancement	0~7	Select the default amount of edge enhancement to be applied to the image.
Smooth	0~7	Set image smoothing.
Frame Persist	0~7	Set image frame correlation.
Line Average	0~7	Set image line softening attribute.
AGC	0~3	Set Automatic Gain Control.
Rejection	0~7	Set image noise restrain attribute.

5.7.5. Presetting Formula

In the preset menu, move the cursor to highlight **Formula** and press **Set** to display formula presetting dialog box, shown as below.

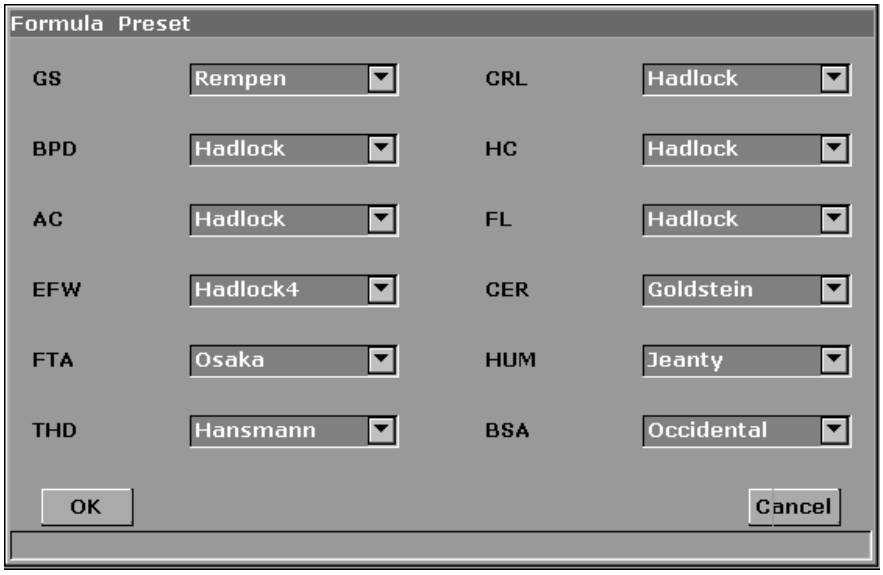


Figure 5-16 Formula Presetting

Table 5-7 Formula Presetting Information

Parameter	References	Parameter	References
GS	Tokyo Hellman Rempen China	CRL	Tokyo Hadlock Hansmann China Robinson
BPD	Tokyo Hadlock Merz Rempen Osaka China	EFW	Tokyo Hadlock1 Hadlock2 Hadlock3 Hadlock4 Shepard Campbell Merz1 Merz2 Hansmann Osaka
AC	Hadlock Merz	FL	Tokyo Hadlock China Jeanty Merz Osaka
HC	Hadlock, Merz	HUM	Jeanty
FTA	Osaka	CER	Goldstein
THD	Hansmann	BSA	Oriental, Occidental

5.7.6. Presetting Post Processing

The preset items include gray map, rejection and gamma correction.

In the preset menu, roll the trackball to highlight menu **Post-Proc** and press **Set**, and then display post processing presetting dialog box, as shown below:

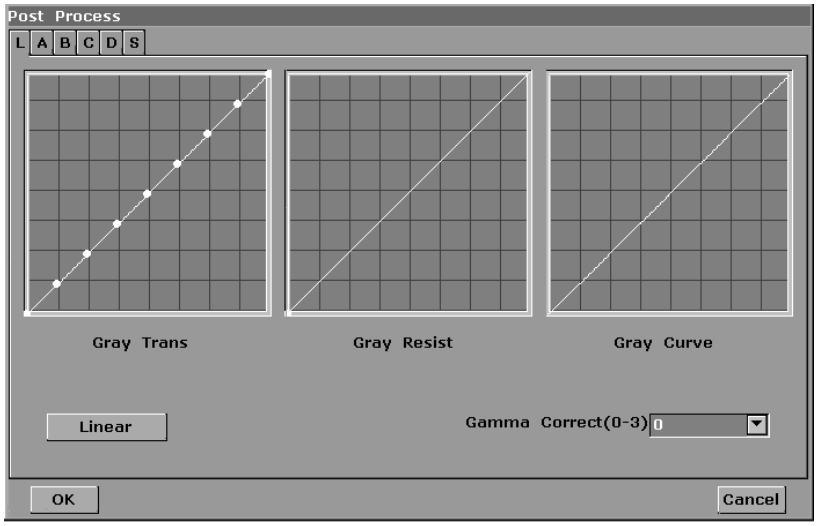


Figure 5-17 Post Processing Presetting

Gray transformation presetting

The gray transformation (Gray Trans) curve has nine infection round nodes. You can reposition them within a specific range to recalculate the curve and update the image.

To preset gray map (take map L for instance):

1. Move the cursor to one of the nine round nodes. Press **Set**, move the node with trackball to adjust the curve.
2. Press **Set** to complete the adjustment, and the Gray Curve is renewed simultaneously.
3. Adjust other nodes using the same method.
4. Roll the trackball to **Linear**, and press **Set**. Then the gray map curve turns a 45° line, and the Gray Curve is renewed simultaneously.

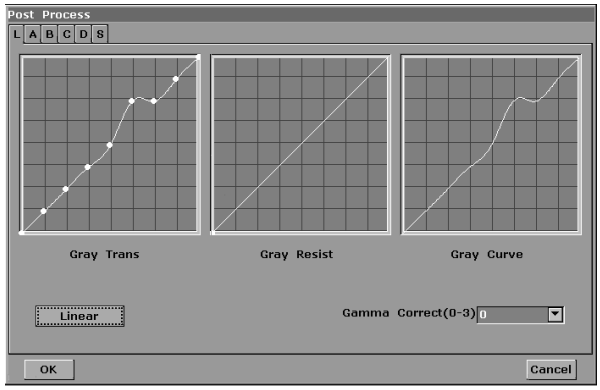


Figure 5-18 Gray Transformation Presetting

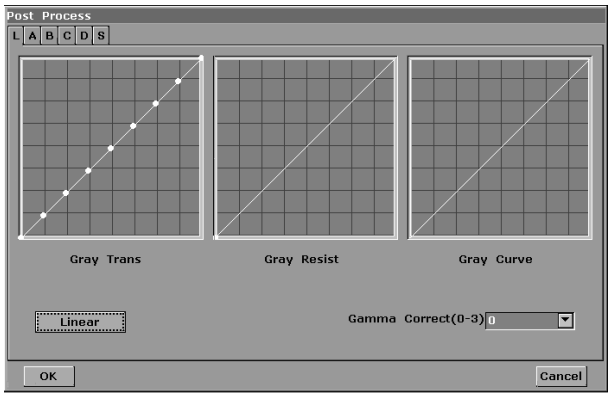


Figure 5-19 Gray Transformation Presetting ---Linear

5. Press **OK** to save the modification, or **Cancel** to give up. At the same time, the dialog box is closed.

NOTE:

Linear is effective for changing the gray transformation curve only, having no effect on the resistance or gamma correction.

Gray resistance presetting

The gray resistance (Gray Resist) curve has one round node. You can reposition it within a specific range to recalculate the curve and update the image.

To preset rejection (take map L for instance):

1. Move the cursor to the node. Press **Set**, and move the node with trackball to adjust the gray resistance curve.
2. Press **Set** to complete the adjustment, and the result curve is renewed simultaneously.

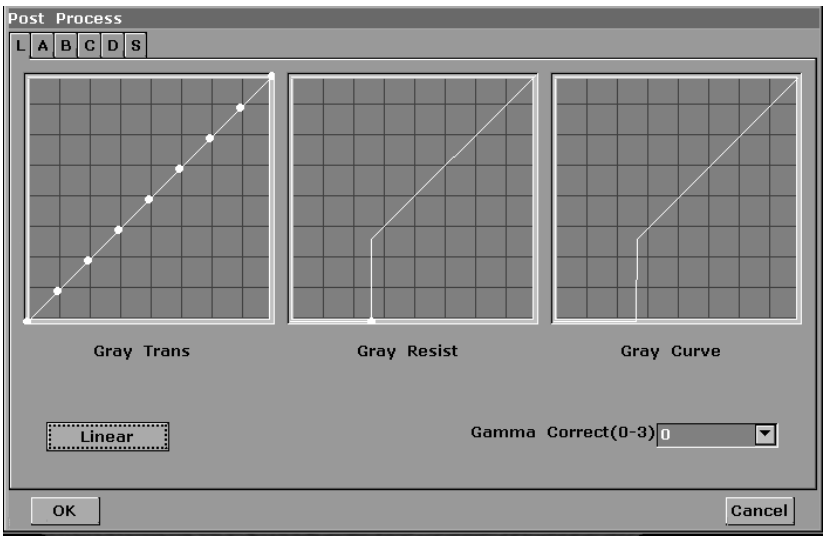


Figure 5-20 Gray Resistance Presetting

3. Press **OK** to save the modification, or **Cancel** to give up. At the same time, the dialog box is closed.

Gamma correction presetting (γ correction):

γ correction has four levels: 0, 1, 2 and 3. You can select any one of the four levels.

5.7.7. Editing Comment Library

There are eight tabs of comment library: generic, abdomen 1, abdomen 2, obstetric, cardiac, small parts, lesion 1 and lesion 2. Each tab has a few sets of comments defined at factory, and you can create up to 6 items user-defined comments for each tab. Creating a comment library for a patient report saves your time, especially for recurring examinations. You can quickly add a comment by using the comment library.

Operation procedure:

1. Press **File**, Roll the trackball to highlight **Preset** and then press **Set** to activate the presetting function.
2. Roll the trackball to highlight **Comment** and then press **Set**. Then the Comment Preset dialog box is displayed, as shown below:

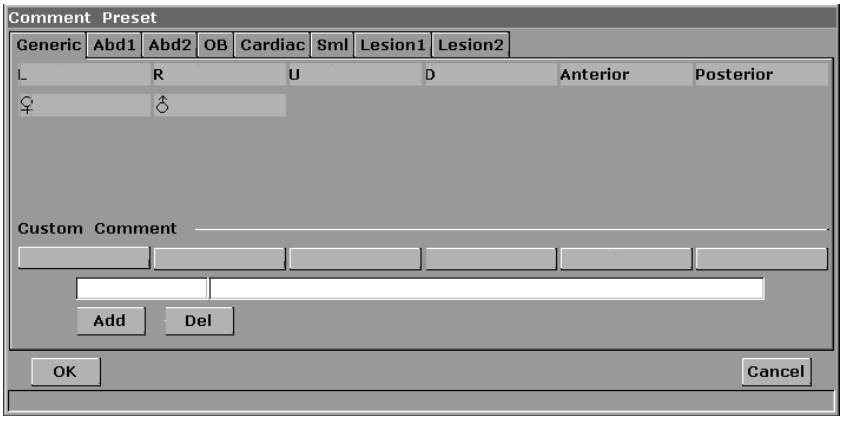


Figure 5-21 Comment Library Presetting

To create text for text list, take **Generic** for instance:

1. Press **Generic** to open the generic comment library.
2. Roll the trackball to highlight one of the custom comments, and press **Set**.
3. Roll the trackball to highlight the left side frame of User-defined, and press **Set**. Then the cursor turns to "I", as shown below. You can enter comment with the keyboard.

Figure 5-22 User-defined Comment Library

4. Roll the trackball to highlight the right side frame of User-defined, and press **Set**. Then the

cursor turns to "I", as shown below. You can enter some detailed and help information about the new created comment with the keyboard.

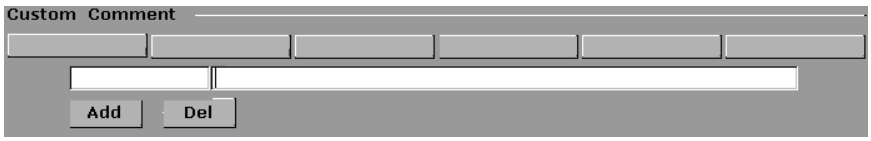


Figure 5-23 User-defined Detailed Information of Comment Library

5. Roll the trackball to highlight **Add** to add the new created comment to Generic.
6. Press **OK** to save the modification, or **Cancel** to give up and close the dialog box.

To delete text from text list:

1. Press **Generic** to open the **Generic**.
2. Roll the trackball to highlight the created comment, and press **Set**.
3. Press **Del** to delete the created comment.
4. Press **OK** to save the modification, or **Cancel** to give up and close the dialog box.

5.7.8. Presetting Data

The secondary menu of preset data is as shown below:

You can use this option to return to the factory default data.

5.7.9. Presetting DICOM

If you have installed the DICOM software, do the DICOM presetting as shown below.

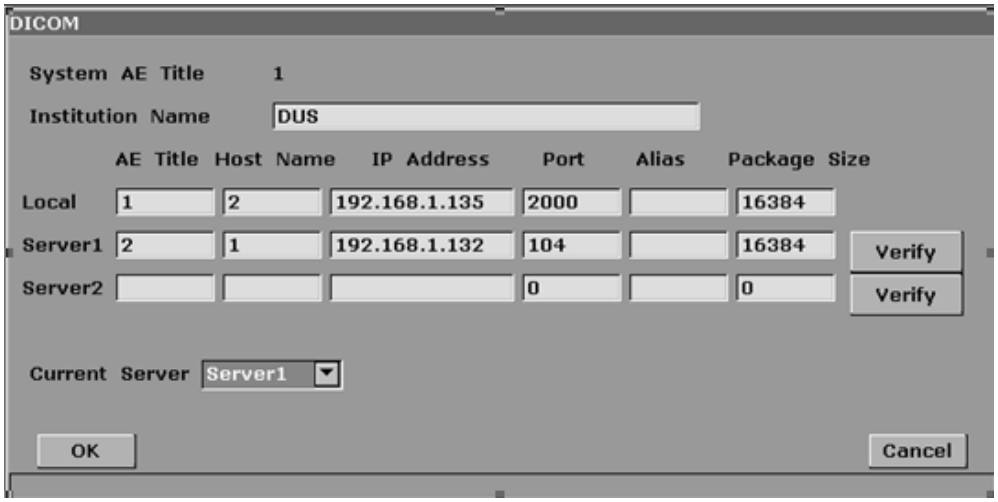


Figure 5-24 DICOM Presetting

Table 5-8 DICOM Presetting Information

Item	Description	
System AE Title	The same as the title set in the **AE Title** of **Local**	
Institution Name	Set the name of the institution	
Local	AE Title	Set the local AE title
	Host Name	Set the local host name
	IP Address	Set the local IP address
	Port	Set the local port
	Alias	Set the alias of the local system
	Package Size	Set the PDU transmission package size, from 4K to 64K, and the default value is **16K**.
Server 1/2	AE Title	Set the server AE title, the same as the **System AE Title** displays
	Host Name	Set the server host name
	IP Address	Set the server IP address
	Port	Set the server port
	Alias	Set the alias of the server
	Package Size	Set the PDU receiving package size, from 4K to 64K, and the default value is **16K**.
Verify	After presetting the server information, press **Verify** to verify the server's connection.	
Current Server	To choose the current server	

Press **OK** to save the presetting and exit, or **Cancel** to exit without saving the presetting.

NOTE:

Do not set a same IP Address for the local system and the server.

Ensure that you have turned on the server before verifying it.

5.7.10. Maintenance

The maintenance can be only done by EDAN authorized personnel.

5.8. Printing

Video printer printing:

1. Connect the VIDEO IN (video input) of the video printer to the VIDEO OUT (video output) of the main unit.
2. Connect the REMOTE of the video printer to the REMOTE of the main unit.

3. Check the printer, referring to the printer user manual.
4. Run the printer.
5. Press **Print** on the keyboard to begin printing.

USB printer printing:

1. Connect the USB printer via the USB port.
2. Check the printer, referring to the printer user manual.
3. Check the **Report Printer** and **Print Report Image** in general preset.
4. Enter the desired worksheet to edit the examination and diagnosis information.
5. Run the printer.
6. Press **Print** of the worksheet dialog box. Printer begins to print.

NOTE:

1. Before printing, make sure there is enough paper for printing.
2. Before printing, make sure the presetting printer type is correct.
3. Before printing, make sure the printer power cord and the USB cable are connected well.
4. DO NOT cut off the printer power supply or the USB cable during printing.
5. If the printer can not work normally, please restart the printer and the DUS 3.

Chapter 6 Operation

6.1. Selecting an Examination Type

Press **Exam** to select an examination type. You can change the examination type at any time by making a selection from the Exam Type menu list, as shown below:

Figure 6-1 Examination Type Menu

6.2. Entering New Patient

Press **New Patient** to clear all the information, and then begin a new patient examination.

NOTE:

When you press **New Patient** Key, system cancels all the recent patient data, comment, measurement, calculation and worksheet, except saved images.

6.3. Entering or Editing Patient Information

Press **Patient Info.** to activate the patient data annotation function, and then enter or edit the patient data using keyboard.

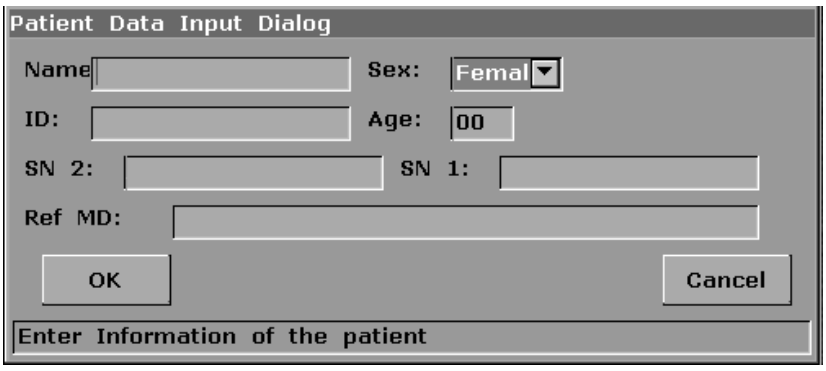


Figure 6-2 Patient Data Input Dialog Box

To switch the input focus: press **Enter**;
To enter the patient information, use the keyboard;

To exit: focus on **OK** or **Cancel**, and then press **Enter** or **Set**.

6.4. Activating a Transducer

While multiple transducers can be connected to the ultrasound system, only one can be activated at a time.

Press **Probe** repeatedly to cycle through the transducers currently connected to the system. The type of the activated transducer is displayed in the top right corner of the screen.

⚠WARNING⚠:

For TRANSDUCER ASSEMBLIES intended for intra-corporeal use (e.g.: E741, E611-1), DO NOT activate the transducers outside the patient's body.

NOTE:

You can use the preset menu to determine which transducer is activated for the corresponding examination type.

6.5. Selecting an Imaging Mode

You can select an imaging mode by pressing , , , , or , and then begin an examination.

Reference

Chapter 5.4.6, Imaging functions.

Reference

Chapter 5.2, Examining.

6.6. Measurement and Calculation

Measurement and calculation functions are contained in each examination type and imaging mode. B-mode generic measurements include distance, trace circumference, ellipse circumference, trace area, ellipse area, two-axis volume, three-axis volume, % stenosis, and angle measurements. M-mode generic measurements include distance, time, slope, and heart rate (2 cycles). You can perform the measurement and calculation in real-time/freezing/zooming/CINE Review playback state. Distance and circumference is presented in mm; area, in mm^2, cm^2, or dm^2; volume, in mm^3, cm^3, dm^3, mL or L; time in ms or s, and heart rate in bpm, etc.

To activate the measurement function, press **Measure**, and then the light is on.

There is one type of mark in B-mode measurement: "+".

There are three types of marks in M-mode measurement: "+", big "+", and a line.

The measurement results are displayed in real-time. After measurement, the outcome is displayed in Measured Results with a serial number. You can measure one to four groups of data. If you continue to measure, the earliest group is automatically covered by the newest one.

NOTE:

1. If you perform the measurement in the frozen status, all the measurements will be canceled when you unfreeze the image.
2. During measurement, press **Back** to delete the former operation.
3. After a complete measurement, press **Back** to erase a measurement at a time.

The generic measurement and calculation include four sets of measurement calipers, four sets of ellipses, four sets of measurement results at most.

The examinations and results are as shown beolw.

Table 6-1 Examination Items and the Results

Examination	Specific measurement labels	Result
Obstetric	GS, CRL, BPD, HC, AC, FL, AFI, TAD, APAD, CER, FTA, HUM, OFD, THD, and EFW	Fetus growth analysis curve and standard obstetric report
Cardiology	LV, RV, Mitral, Aorta, etc.	Cardiac report
Gynecology	UT, Endo, OV-Vol, FO, CX-L, UT-L/CX-L	Gynecology report
Small parts	THY	THY report
Urology	RUV and PV	Urology report
Orthopedics	HIP	HIP report
Abdominal	None	General report

The system-defined examinations are abbreviated as follows:

Abd: Abdominal

OB: Obstetric

SML: Small Parts

GYN: Gynecology

ORTHO: Orthopedics

UROL: Urology

6.6.1. B-mode Generic Measurements

The default measurement of B-mode is distance measurement. B-mode measurement menus are as shown below:

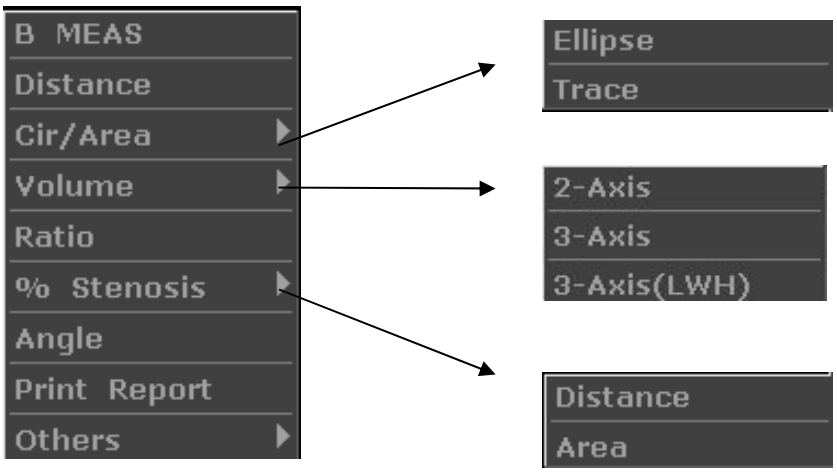


Figure 6-3 B Mode Generic Measurement and Calculation Menu

Distance

To measure distance:

1. Press **Measure** to activate measurement function.
2. Roll the trackball to highlight menu **Distance**, press **Set** to activate a measurement cursor "+" on the screen.
3. Roll the trackball and press **Set** to anchor the start point.
4. Roll the trackball and press **Set** to anchor the end point.
5. Roll the trackball and press **Set** to begin a new distance measurement. You can measure a maximum of four groups of data. The outcome is displayed in Measured Results, as shown below.
6. Press **Measure** to finish and exit.

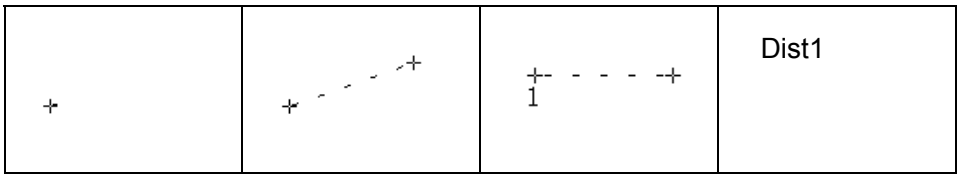


Figure 6-4 Distance Measurement and the Results

Circumference/Area

- **Ellipse Method**

To measure Circumference / Area:

1. Press **Measure** to activate measurement function.
2. Roll the trackball to highlight menu **Cir/Area**. Then select **Ellipse**, and press **Set** to activate a measurement cursor "+" on the screen.
3. Roll the trackball and press **Set** to anchor the start point of fixed

axis of ellipse.

4. Roll the trackball and press **Set** to anchor the end point of fixed axis of ellipse.
5. Roll the trackball, and press **Set** to define the size of the ellipse.
6. Roll the trackball and press **Set** to begin a new circumference/area measurement. You can measure a maximum of four groups of data. The outcome is displayed in Measured Results, as shown below.
7. Press **Measure** to finish and exit.

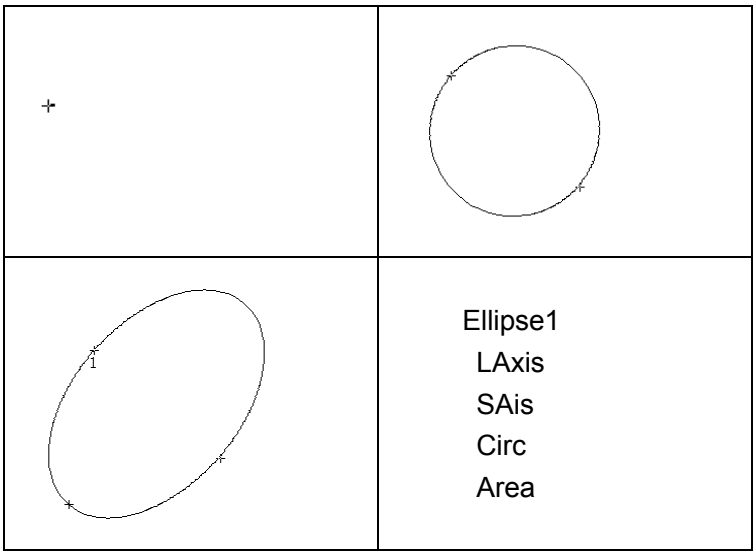


Figure 6-5 Ellipse Circumference/Area Method and the Results

- **Trace Method**

To measure Circumference / Area:

1. Press **Measure** to activate measurement function.
2. Roll the trackball to highlight menu **Cir/Area**. Then select **Trace**, and press **Set** to activate a measurement cursor on the screen.
3. Roll the trackball and press **Set** to anchor the start point.
4. Roll the trackball to outline the region of interest. As you move the trackball, the system displays dots to outline the structure. To correct an error in the trace, press **Back** to move in reverse along the traced outline. Roll the trackball to move forward again. The system automatically closes the loop when the last measurement marker is moved very near to the start point. Or press **Set** to close the loop. The system draws a line from the position of the active measurement marker to the beginning of the loop.
5. Roll the trackball and press **Set** to begin a new circumference/area

measurement. You can measure a maximum of four groups of data. The outcome is displayed in Measured Results, as shown below.

6. Press **Measure** to finish and exit.

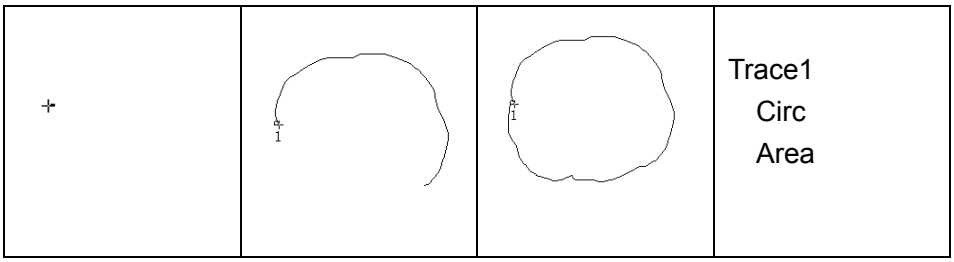


Figure 6-6 Trace Circumference/Area Method and the Results

Volume

- **2-Axis volume method**

$V= (\pi/6) \times A \times B^2$, (A: the length of major axis. B: the length of minor axis)

Two-axis volume method can be used to perform volume measurement by calculating only 1 set of measured data.

Operating Method:

The two-axis volume method is similar to the generic B-mode Cir/Area measurement ellipse method. You can measure a maximum of four groups of data.

- **3-Axis method**

$V= (\pi/6) \times A \times B \times M$,

(A: the length of major axis. B: the length of minor axis. M: the length of the third axis.)

Three-axis method can be used to perform volume measurement by calculating 2 sets of measured data, EA and the length of the third axis. To complete volume measurement, first measure EA by ellipse method, and then measure the length of the third axis with the distance measurement method, and the value of volume is displayed automatically.

To measure volume:

In the **B-mode**

1. Obtain a cross-section image and freeze the system.
2. Measure the lengths of the major axis and the minor axis of the cross section with the ellipse method.
3. Unfreeze the system to acquire a new image (vertical-section image), and then freeze it.

4. Measure the length of the third axis in the vertical section image with the distance measurement method. You can measure a maximum of one group of data. The outcome is displayed in Measured Results.

In the **2B-mode** or **4B-mode**

To measure volume:

1. Obtain the cross-section image and the vertical-section image.
2. Measure the lengths of the major axis and the minor axis of the cross section with the ellipse method.
3. Roll the trackball to the next image (vertical section image), measure the length of the third axis with the distance measurement method. The outcome is displayed in Measured Results, as shown below.
4. Press **Measure** to finish and exit.

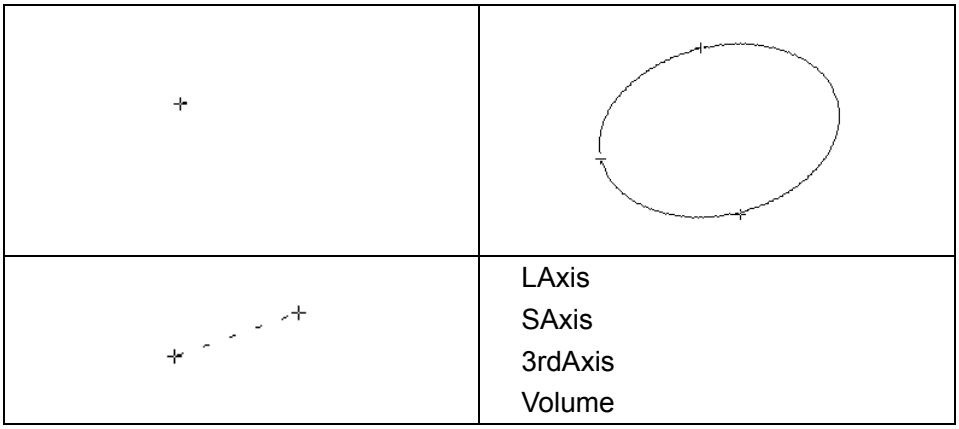


Figure 6-7 3-Axis Volume Method and the Results

- **3-Axis (LWH) method**

$V = (\pi/6) \times L \times W \times H$,

(L: the length. W: the width. H: the height.)

Three-axis (LWH) method can be used to perform volume measurement by calculating 3 sets of distance data, L, W, and H. Measure the three data in the method of B-mode generic distance measurement, and then the value of volume will be displayed automatically.

To measure volume:

In the **B-mode**

1. Obtain a cross-section image and freeze the system.

2. Measure the length and the width.

3. Unfreeze the system to acquire a new image (vertical-section image), and then freeze it.

4. Measure the height. You can measure a maximum of one group of data. The outcome will be displayed in Measured Results.

In the **2B-mode** or **4B-mode**

1. Obtain the cross-section image and the vertical-section image.

2. Measure the length and the width.

3. Roll the trackball to the next image, vertical section image, measure the height. The outcome will be displayed in Measured Results, as shown below.

4. Press **Measure** to finish and exit.

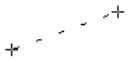
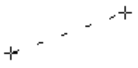
	
	Length Width Height Volume

Figure 6-8 3-Axis (LWH) Volume Method and the Results

Ratio

To determine the ratio, take two measurements: A and B. The system calculates the ratio: A/B or B/A.

To measure ratio:

1. Press **Measure** to activate measurement function.
2. Roll the trackball to highlight menu **Ratio**, and press **Set** to activate a measurement cursor on the screen.
3. Measure the first distance A with the distance measurement method.
4. Measure the second distance B, move the cursor and press **Set** to anchor start point, and the mark "+" appears. Move the cursor with trackball, Measurement Results displays the real time measurement value and calculation result.
5. During measurement, you can press **Change** once to change the settled point and the active point; if you press **Change** a second time, the system interchanges the numerator and denominator.
6. Roll the trackball and press **Set** to complete the measurement, and the calculation result is displayed in Measured Results.
7. Roll the trackball and press **Set** to begin a new ratio measurement.

You can measure a maximum of four groups of data. The outcome is displayed in Measured Results.

8. Press **Measure** to finish and exit.

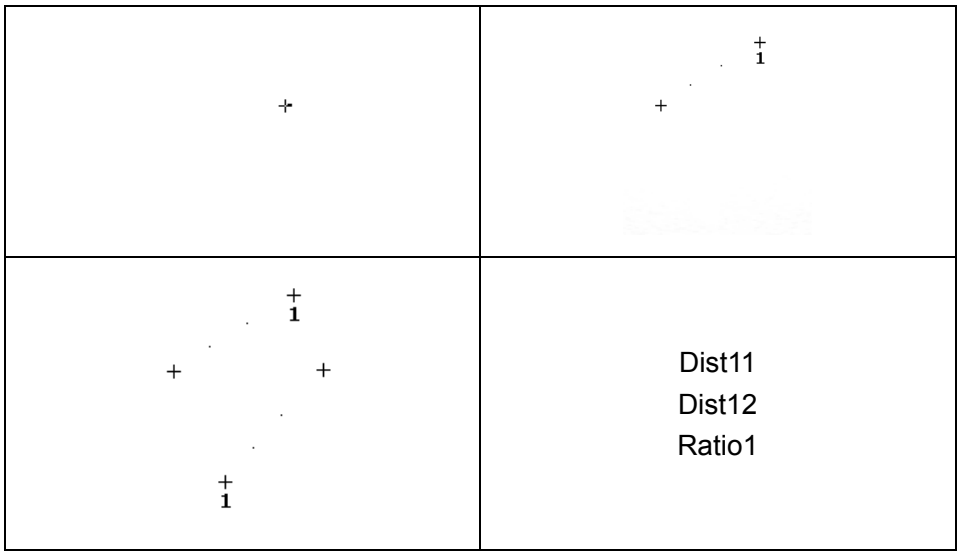


Figure 6-9 Ratio Measurement and the Results

% Stenosis

- **Distance stenosis**

To determine the distance stenosis, take two distance measurements: A and B. The system calculates the stenosis: (A-B)/A * 100%.

To measure distance stenosis:

1. Press **Measure** to activate measurement function.
2. Roll the trackball to highlight menu **% Stenosis**, and select **Distance**, and then press **Set** to activate a measurement cursor on the screen.
3. Measure the first distance with the distance measurement method.
4. Measure the second distance, move the cursor and press **Set** to anchor start point, and the mark "+" appears. Move the cursor with trackball, Measurement Results displays the real time measurement value and calculation result.
5. During measurement, you can press **Change** to change the start point and the end point; if you press **Change** again, the system interchanges the numerator and denominator.
6. Roll the trackball and press **Set** to complete the measurement, and the calculation result is displayed in Measured Results.
7. Roll the trackball and press **Set** to begin a new stenosis measurement. You can measure a maximum of four groups of data. The outcome is displayed in Measured Results.

8. Press **Measure** to finish and exit.

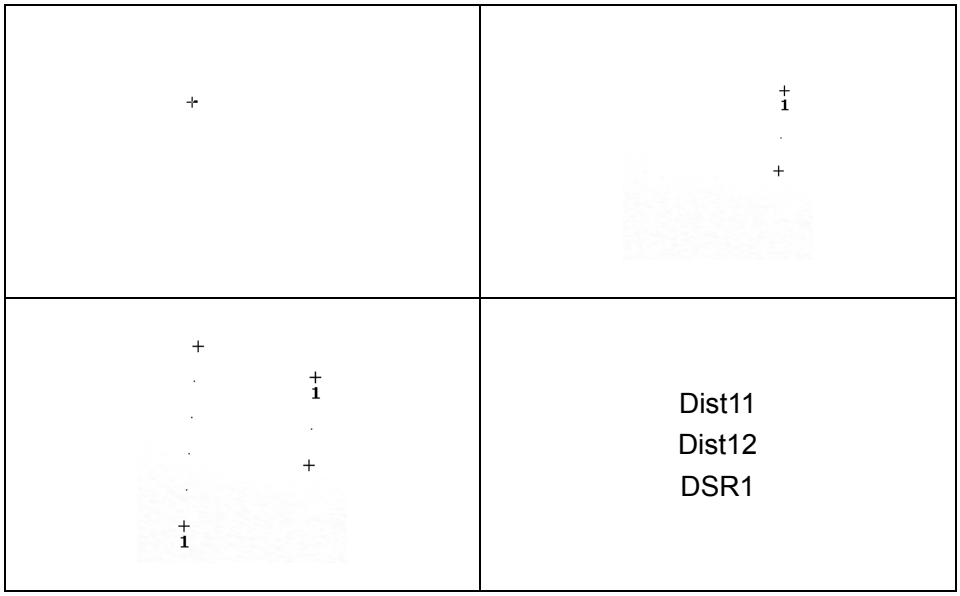


Figure 6-10 Distance Stenosis Measurement and the Results

- **Area stenosis**

To determine the area stenosis, take two area measurements: A and B. The system calculates the stenosis: (A-B)/A * 100%.

To measure area stenosis:

1. Press **Measure** to activate measurement function.
2. Roll the trackball to highlight menu **% Stenosis**, and select **Area**, and then press **Set** to activate a measurement cursor on the screen.
3. Measure the first area with the ellipse method.
4. Measure the second area, move the cursor and press **Set** to anchor start point, and the mark "+" appears. Move the cursor with trackball, Measurement Results displays the real time measurement value and calculation result.
5. During measurement, you can press **Change** to change the start point and the end point.
6. Roll the trackball and press **Set** to complete the measurement. You can measure a maximum of one group of data. The outcome is displayed in Measured Results.
7. Press **Measure** to finish and exit.

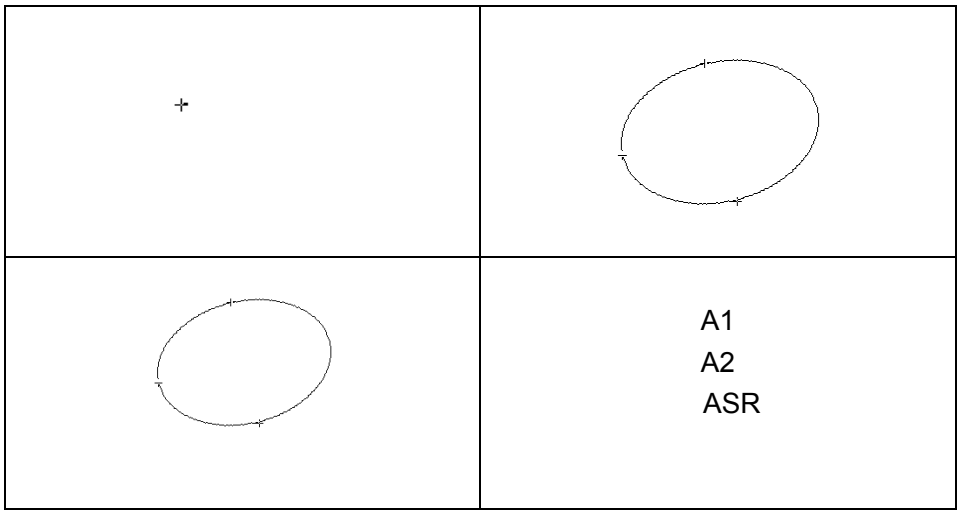


Figure 6-11 Area Stenosis Measurement and the Results

Angle

To determine an angle, draw two lines: A and B. The system calculates the angle.

To measure angle:

1. Press **Measure** to activate measurement function.
2. Roll the trackball to highlight menu **Angle**, and then press **Set** to activate a measurement cursor on the screen.
3. Draw the first line A with the distance measurement method.
4. Draw the second line B, move the cursor and press **Set** to anchor start point, and the mark "+" appears. Move the cursor with trackball, Measurement Results displays the real time measurement value and calculation result.
5. During measurement, you can press **Change** to change the start point and the end point; if you press **Change** again, the system interchanges line A and line B.
6. Roll the trackball and press **Set** to complete this measurement.
7. Roll the trackball and press **Set** to again begin a new angle measurement. You can measure a maximum of four groups of data. The angles formed by the two lines are displayed in Measured Results, in units of degrees. The outcome is displayed in Measured Results.
8. Press **Measure** to finish and exit.

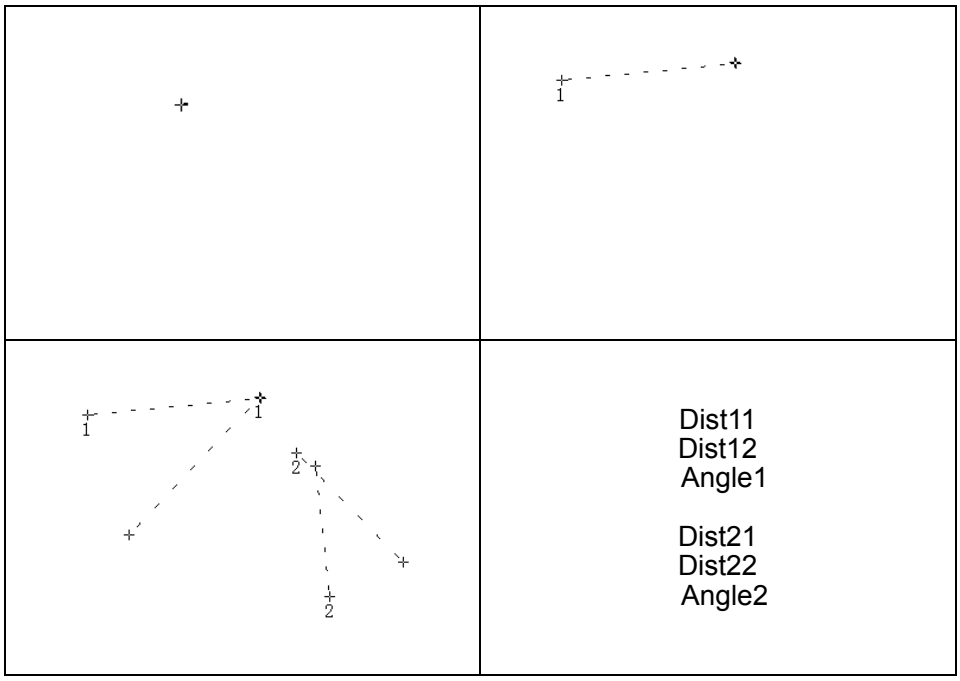


Figure 6-12 Angle measurement

Others

Roll the trackball to highlight **Others** to select the desired measurements and calculations.

6.6.2. M-mode Generic Measurements

M-mode measurement and calculation include distance, time, slope and heart rate (2 cycles). These are for B/M and M Display Mode Only. The default measurement of B/M and M-mode is heart rate measurement. M-mode measurement menus are as shown below:

Figure 6-13 M Mode Generic Measurement and Calculation Menu

Distance To measure distance:

1. Press **Measure** to activate a measurement cursor "+".
2. Roll the trackball to highlight **Distance** and press **Set**.
3. Roll the trackball and press **Set** to anchor the start point, and a big "+" is displayed.
4. Roll the trackball and press **Set** to anchor the end point.
5. Roll the trackball and press **Set** to begin a new distance measurement. You can measure a maximum of four groups of data. The outcome is displayed in

Measured Results, as shown below.

6. Press **Measure** to finish and exit.

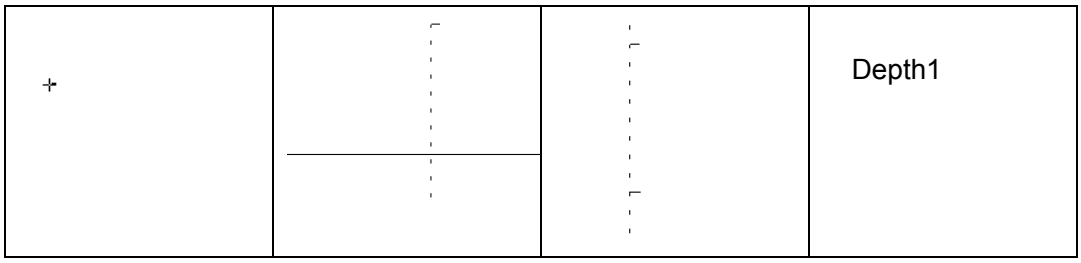


Figure 6-14 Distance Measurement and the Results

Time

To measure time:

1. Press **Measure** to activate a measurement cursor "+".
2. Roll the trackball to highlight **Time** and press **Set**.
3. Roll the trackball to move the first measurement cursor at the beginning of the time interval and then press **Set**, and the measurement mark turns to a vertical line.
4. Roll the trackball to move the first measurement cursor at the end of the time interval and then and press **Set**.
5. Roll the trackball and press **Set** to begin a new time measurement. You can measure a maximum of four groups of data. The outcome is displayed in Measured Results, shown as below.
6. Press **Measure** to finish and exit.

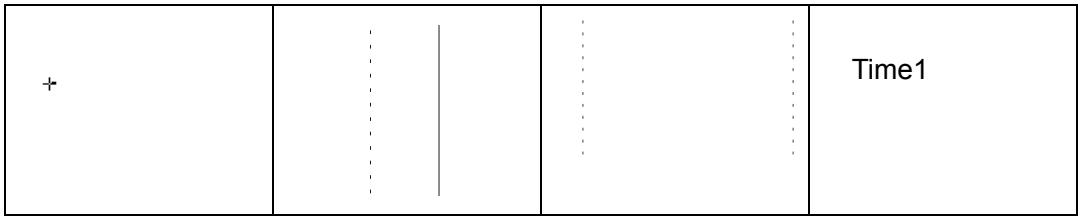


Figure 6-15 Time Measurement

Slope

To measure slope:

1. Press **Measure** to activate a measurement cursor "+".
2. Roll the trackball to highlight **Slope** and press **Set** and a big "+" is displayed.
3. Roll the trackball and press **Set** to anchor the start point, and displays a big "+".
4. Roll the trackball and press **Set** to anchor the end point.
5. Roll the trackball and press **Set** to begin a new slope measurement. You can measure a maximum of four groups of data. The outcome is displayed in Measured Results, as shown below.
6. Press **Measure** to finish and exit.

.

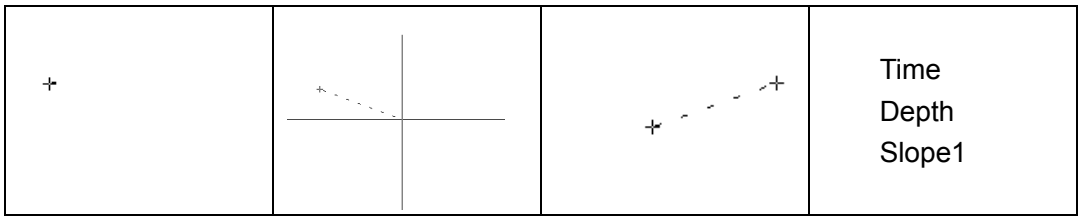


Figure 6-16 Slope Measurement and the Results

Heart Rate

To measure heart rate:

1. In the **B/M-mode**, roll the trackball to change the position of the M Mark and press **Set** to obtain a satisfying electrocardiogram, and then freeze it.
2. In the **M-mode**, freeze the desired image.

Measure the distance between two peaks of cardiac cycles with the time measurement method.

1. Press **Measure** to activate a measurement cursor "+".
2. Roll the trackball to highlight **Heart Rate** and press **Set** and a "+" is displayed.
3. Roll the trackball to move the first measurement maker on the first peak systole and then press **Set** to anchor start position, and the measurement mark turns to a vertical line.
4. Roll the trackball to move the second measurement maker on the peak systole following two complete cycles and then press **Set** to anchor end position.
5. Roll the trackball and press **Set** to begin a new heart rate measurement. You can measure a maximum of four groups of data. The outcome is displayed in Measured Results.
6. Press **Measure** to finish and exit.

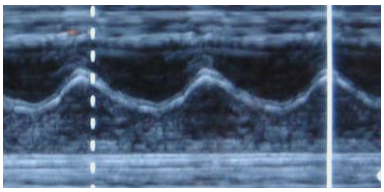


Figure 6-17 Heart Rate Measurement

NOTE:

In **B/M-mode**, you should define the M Mark position, and then begin the measurement.

6.6.3. General Report

General ultrasound report:

General Ultrasound Report			
Hospital:			
Name:	ID:	Age:	Sex:
SN 1:	SN 2:	Ref MD:	

Ultrasonic image

Exam:

Diagnosis:

Signature (Seal)
Date

6.7. CINE Review

Activate the device and enter the real-time B, B/B, 4B, or B/M scanning mode. Enable the system to collect images before CINE Review playback. The cine function includes frame-by-frame playback and motion playback. Then the cine review symbol is displayed on the bottom of the screen, as shown below:

Figure 6-18 CINE Review Symbol

To perform the CINE Review playback:

1. Press **Freeze** to freeze the image, and the system displays the cine menu, as shown below:

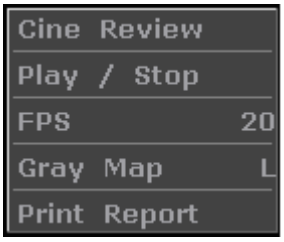


Figure 6-19 Cine Review Menu

2. Roll the trackball to start playing back frame by frame. Roll the trackball to the right to advance the cine data one frame at a time, or to the left to move the data in reverse. The arrow on the CINE Review Symbol indicates the direction toward which the data is moving. The loop of data wraps around when either end is reached. As the trackball is moved, the current cine number is displayed on the right of the CINE Review Symbol.
3. Press **Cine** to stop playing back, and then roll the trackball to highlight **Play/Stop** and press

Set to enter the motion playback mode.

4. During playing back, press **Play/Stop** to play or to stop.
5. Press **Cine** to go back to the frame-by-frame mode.
6. Press **Freeze** to exit the CINE Review playback.

The default setting is to load images by serial numbers forward.

NOTE: The FPS is adjustable, from 5 to 50, in increments of 5.

6.8. File Management

Press **File** to display the file menu, as shown below:

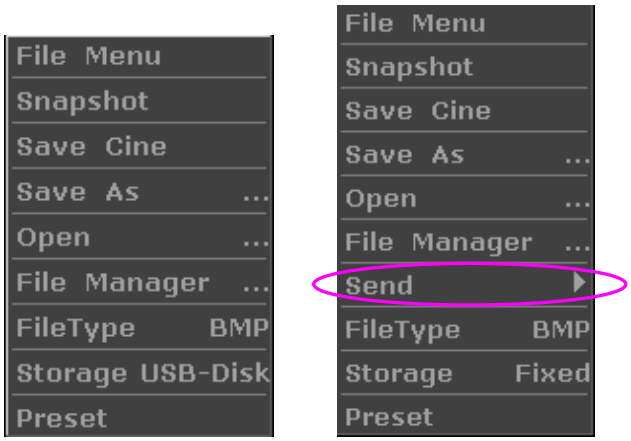


Figure 6-20 File Menu (the left—with no DICOM installed, the right—with DICOM installed)

6.8.1. Saving Images

You can use **Snapshot**, **Save Cine** or **Save As** to save files.

The snapshot types include BMP, DCM (if DICOM is installed), and JPG, and the storage disk can be a fixed one or a removable one. You can use the **Set** to set the types before saving images.

The system provides two ways to save images: using **File** >> **Save As…** or press **Snapshot**. After connecting the removable disk, the USB indicator on the panel is on.

When obtaining a satisfying image:

1. Press **File** and select **Save As…** to display the **File Save As** dialog box. Use the keyboard to enter an image name of up to ten characters.

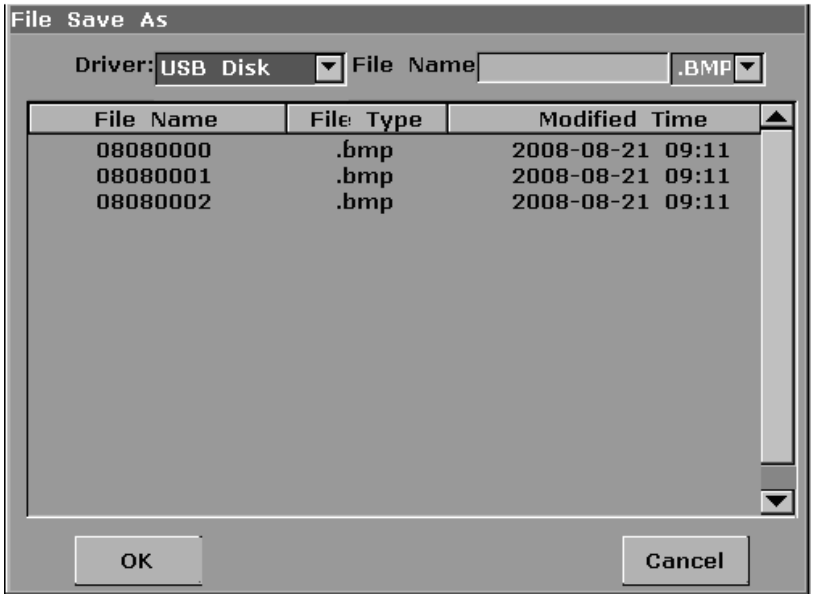


Figure 6-21 File Saving Dialog Box

You should choose the driver and the file type; you can enter the file name for the image with the keyboard.

2. Press **Snapshot** directly to save the image. At the same time, the saving information is automatically displayed in the middle of image area.

These images are automatically numbered in sequence. For instance, if the latest number comes to YYMM0020, and then you press **Snapshot**, the current image is saved as numbered YYMM0021.

6.8.2. Opening Images

Press **File** in the real-time/freezing mode, and the system displays the file menu. Then select **Open** and press **Set** to display an **Open File** dialog box, as shown below.

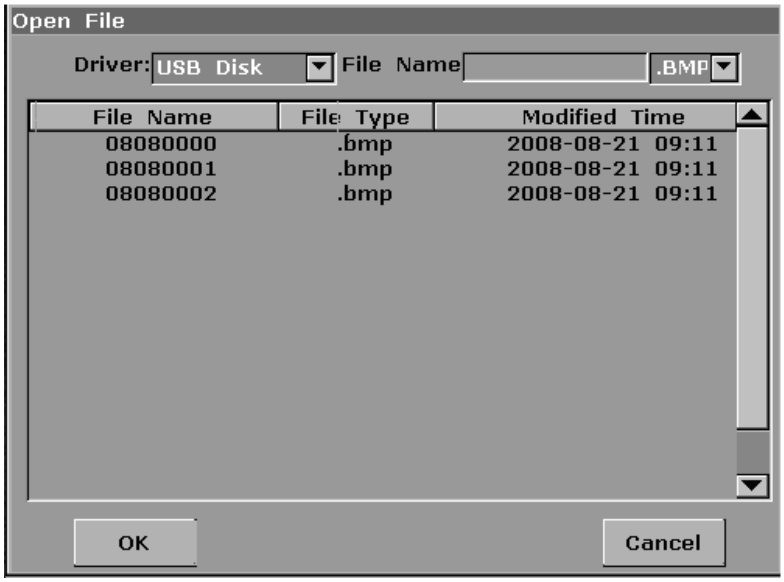


Figure 6-22 File Opening Dialog Box

The default driver is the local disk, and the default file type is **.BMP**. The file types include BMP, JPG, DCM, and CIN. Pressing the symbol "▼" to display the driver or the file type, and then roll the trackball to choose the type.

Select a desired File name, and press **OK**, the system begins to load the corresponding image. A prompt instruction **Loading file…** is displayed in the middle of the screen. Then the prompt instruction disappears and the system displays the designated image.

NOTE:

1. Images that have not yet been saved in the saving zone can not be loaded.
2. When saving or loading image is still in process (prompt instruction Saving file… or Loading file…), please do not perform any other operation. This is to avoid damaging the device.
3. You should freeze the system before opening Cine Images.

6.8.3. Browsing Images

After you open an image, press << to open the previous image, and >> to open the next image; press Exit to exit the browsing.

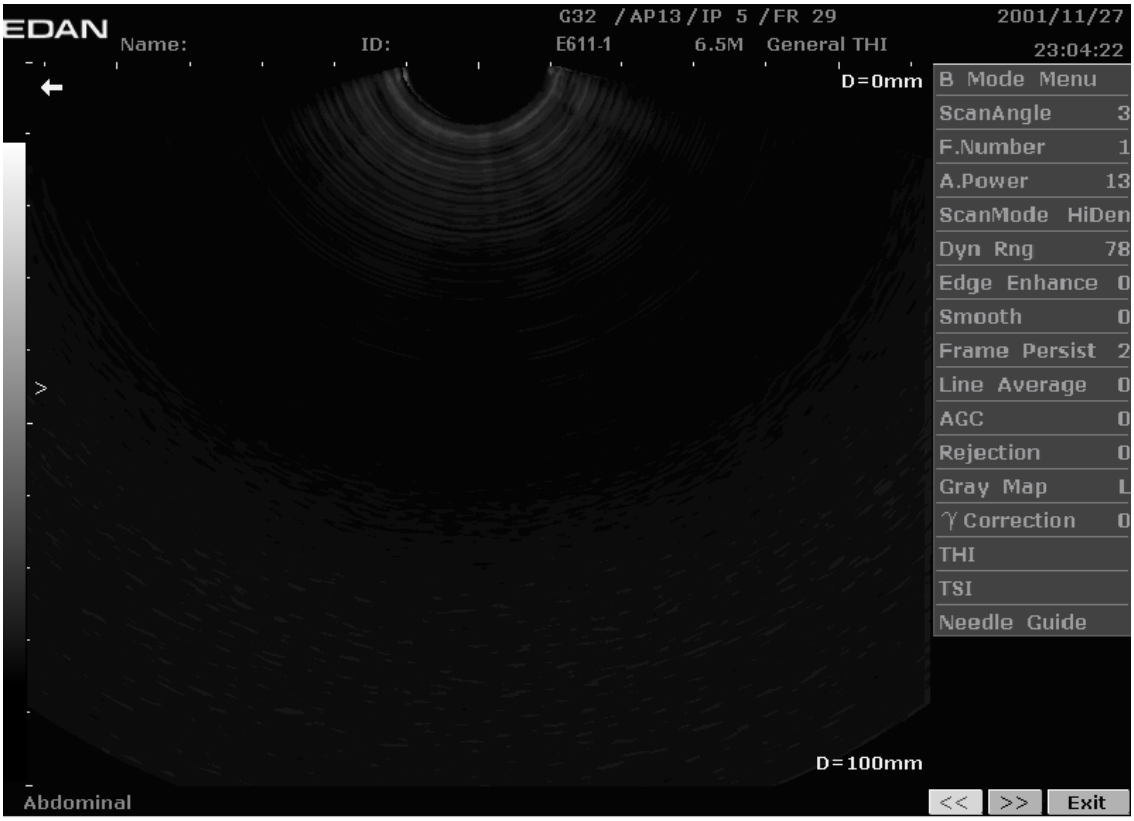


Figure 6-23 Image Browsing Dialog Box

6.8.4. File Manager

The file manager dialog box is shown as below.

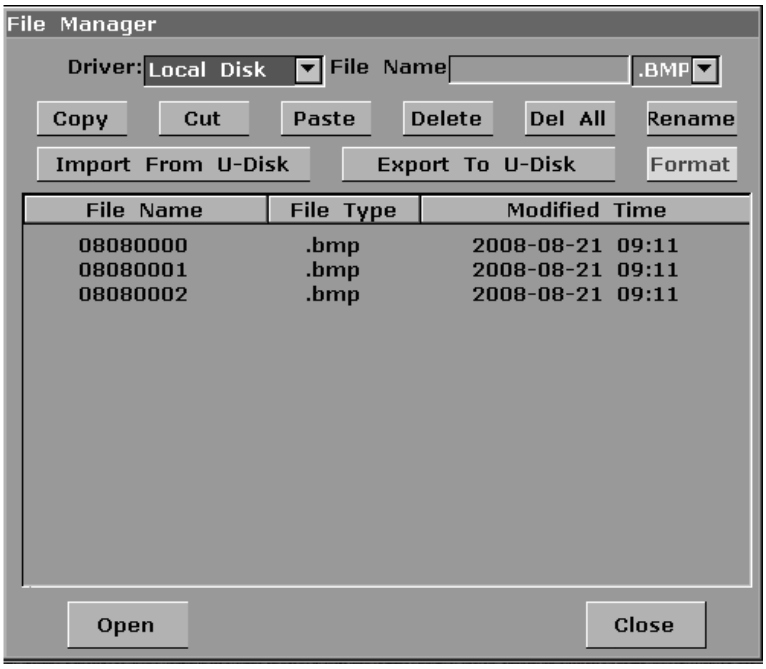


Figure 6-24 File Manager Dialog Box

You can use the file manager to do the file management. After you open an image, you can do the image viewing as shown in section 6.8.3.

NOTE:

- When you are copying & pasting a file, cutting & pasting a file, importing a file or exporting a file, do not pull in or pull out the U disk.
- USB disk must be in FAT format.
- Do not use the u-disk for other use, but only for this device. Otherwise the storage and the transmission function may not be stable.
- We suggest that you use the NETAC U disk: U200/U205/U210.

To copy & paste a file:

1. Roll the trackball to select the source driver and the type of file, and then press **Set**.
2. Roll the trackball to highlight the source file, and press **Set**, and then press **Copy**.
3. Roll the trackball to select the destination driver and press **Set**.
4. Press **Paste**.

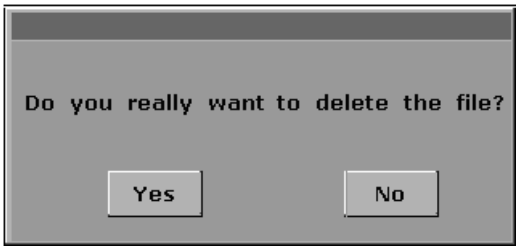
To cut & paste a file:

1. Roll the trackball to select the driver and the type of file, and then press **Set**.

2. Roll the trackball to highlight the file that will be cut, and press **Set**, and then press **Cut**.
3. Roll the trackball to select the destination driver and press **Set**.
4. Press **Paste**.

To delete a file:

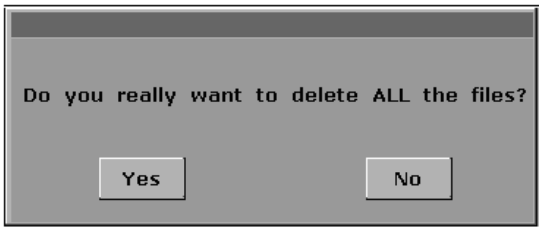
1. Roll the trackball to select the driver and the type of file, and then press **Set**
2. Roll the trackball and then press **Set** to select the file you want to delete.
3. Press **Delete**, a prompt instruction is displayed in the middle of the screen, as shown below:



4. Press **Yes** to delete the designated file, or **No** to give up the deleting operation.

To delete all:

1. Roll the trackball to select the driver and the type of file, and then press **Set**.
2. Press **Del All**, a prompt instruction is displayed in the middle of the screen, as shown below:



3. Press **Yes** to delete the all the files, or **No** to give up the deleting operation.

To rename a file:

1. Roll the trackball to select the driver and the type of file, and then press **Set**.
2. Roll the trackball and press **Set** to select the file you want to rename,.
3. Press **Rename** to open the dialog box, as shown below, and enter the new name of the file using the keyboard, with a maximum of eight characters.

4. Press **OK** to rename the designated file, or **Cancel** to give up the renaming operation.

To import from U-disk:

You can use the **Import From U-Disk** button to import all the files from U-disk to the local disk.

To export to U-disk:

You can use the **Export To U-Disk** button to export all the files from local disk to U-disk.

6.8.5. Sending Image / File

If you have installed the DICOM software, and the DICOM presetting has been performed correctly, you can send images / files.

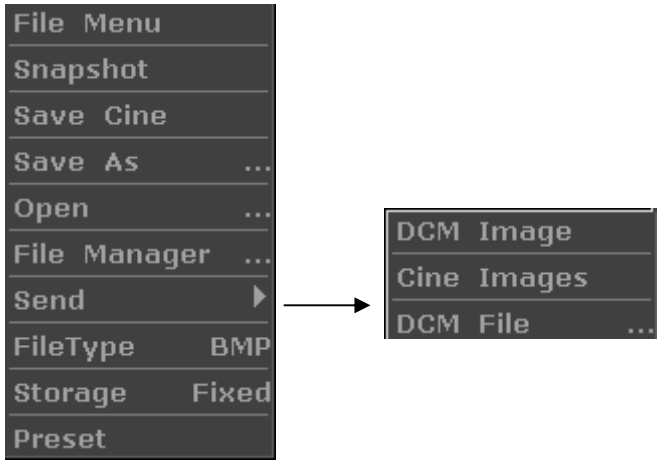


Figure 6-25 File Menu (with DICOM Function)

To send DCM Image

1. Highlight the secondary menu **DCM Image**, and then press **Set**.

2. If the server is running normally, the current image will be sent to the server.

3. The system displays a prompt indicating the successful transmission.

To send Cine Images

1. Freeze the system.

2. Press **File** to enter the file menu.

3. Highlight the secondary menu **Cine Images**, and then press **Set**.

4. If the server is running normally, the current Cine images will be sent to the server.

5. The system displays a prompt indicating the successful transmission.

To send DCM file

1. Highlight the secondary menu **DCM File**, and then press **Set**.

2. The system pops up the File Opening Dialog Box for selecting a DCM file to be transmitted.

3. If the server is running normally, the selected file will be sent to the server.

4. The system displays a prompt indicating the successful transmission.

6.9. Puncture Function

NOTE: Use proper disinfection techniques at all times to perform a biopsy.
Always follow these basic precautions:

⚠WARNING⚠:

1. Disinfect the needle guide before the first use and after each subsequent use.
2. Always handle transducers and needle guide adaptors with care. Do not use a transducer or an adaptor if it has been dropped or struck against a hard surface until it is inspected by an EDAN customer engineer.
3. The displayed needle guide pathway on the EDAN video monitor is intended for reference during biopsy procedures. A variety of factors outside EDAN's control, such as changing tissue density, bending of the needle, off-axis pressure by the person holding the transducer, may cause deflection of a needle outside of the displayed video pathway even when the transducer, needle guide, and the system software are all performing as intended and within manufacturing specification. The specialist performing a biopsy procedure must be aware of potential external factors when executing an invasive procedure.
4. The caliper must be placed along the needle path. If not, the displayed measurements may be incorrect.
5. EDAN needle guides are designed and manufactured to attach firmly to designated transducers and should not require excessive force to assemble or disassemble. If it appears that excessive force or manipulation is required to assemble or disassemble needle guide components, please contact your EDAN customer engineer before using it.

To enable the puncture function:

In real-time B mode imaging, highlight **Needle Guide** and then press **Set**. Prompt information **Needle guide line must be calibrated prior to each puncture** is displayed on the screen. Press **Close** and enter the puncture function and a needle guide menu is displayed, shown as below.

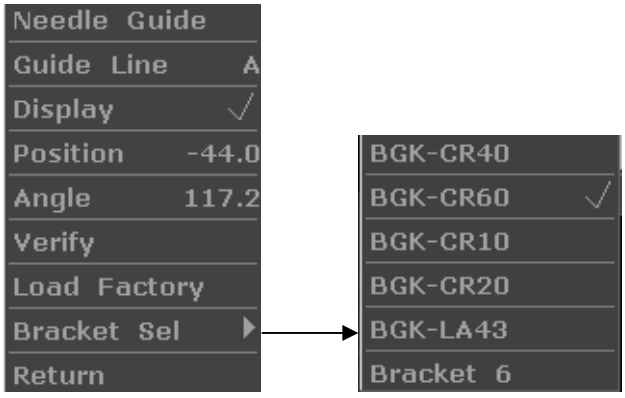


Figure 6-26 Needle Guide Menu

To exit puncture function:

Press **Return** of the needle guide menu to exit puncture function, the needle guide menu is closed and the needle guide line in image disappears.

⚠**WARNING**⚠**:** DO NOT freeze the system when doing puncture.

NOTE: There are no more than 3 needle guide lines for each puncture frame.

- If image depth ≤ 8 cm, the distance between the two nods of the needle guide line indicates 0.5 cm.
- If image depth > 8 cm, the distance between the two nods of the needle guide line indicates 1 cm.

6.9.1. To Select the Angle of Needle Guide Line

If the puncture frame has several kind of angle, you can highlight **Guideline** in the needle guide menu and press **Set** to make a choice, and the system displays the angle.

6.9.2. To Display or To Hide the Needle Guide Line

Highlight **Display** in the needle guide menu, and press **Set** repeatedly to display or to hide the needle guide line.

6.9.3. To Adjust the Needle Guide Line

Needle guide line has been verified when the device is produced. The value is saved in Factory data. But after a period of use, the needle guide line needs to be adjusted since the real value may be changed.

⚠**WARNING**⚠**:**

1. Prior to each puncture, calibrate the needle guide line.
2. If the needle position is not the same as the needle guide line position, do not do the puncture.

◆ To verify the needle guide line:

Move the needle guide line horizontally

Highlight **Position**, press **Set** to increase the value and **Back** to decrease the value, and the value is displayed in the menu option.

◆ To adjust the angel of needle guide line:

Enter **Angle** option to adjust the angle. Operation procedure is the same as that of the **Position**.

◆ To save the verified value:

After verifying the position and the angle, highlight **Verify** and press **Set**, and the system saves

the verified value. After restarting the system, the verified value is activated.

◆ To save the factory data:

Highlight **Load Factory** and press **Set** to load the factory data.

◆ To select the bracket:

If the probe has different brackets, you can use the **Bracket sel** option to select the bracket.

Chapter 7 Obstetric Measurement and Calculation

The obstetric examination is usually in the B-mode.

Enter B-mode obstetric examination:

1. Press **Exam** and select **Obstetric**, and then press **Set**.
2. Press to enter the B-mode.
3. Press **Measure** to activate the measurement function. The measurement menu is displayed.

7.1. Abbreviations

The abbreviations used in this manual are shown as below:

- EDC: Estimated Date of Confinement
- MA: Menstrual Age
- LMP: Last Menstrual Period
- BBT: Basal Body Temperature
- EFW: Estimated Fetal Weight

7.2. Obstetric Measurement and Calculation

1. Items of Measurement and Calculation

B-OB MEAS: GS, CRL, BPD, HC, AC, FL, EFW, and AFI.

B-OB MEAS 2: TAD, APAD, CER, FTA, HUM, OFD, and THD.

Figure 7-1 Obstetric Measurement and Calculation Menu

2. Items of input

LMP and BBT

7.3. Fetus Growth Measurement

Fetus growth is usually measured by the following parameters.

B-OB MEAS: the default measurement is distance measurement.

Table 7-1 Obstetric Measurement

Label	Description	Channel	Method	Results display
GS	Gestational Sac Diameter	1	Distance (mm)	MA will be displayed only when the measured parameter value is in the valid range of the preset formula.
CRL	Crown Rump Length	1		
BPD	Biparietal Diameter	1		
HC	Head Circumference	1	Ellipse or Trace Circumference (mm)	
AC	Abdominal Circumference	1		
FL	Femur Length	1	Distance (mm)	
AFI	Amniotic Fluid Index	1	Calculating AFI requires 4 sets of distance measurement data, AF1, AF2, AF3, and AF4.	
EFW	Estimated Fetal Weight	1	According to the selected formula, described as follows. (g or Kg)	

B-OB MEAS 2: the default measurement is TAD measurement.

Table 7-2 Obstetric Measurement 2

Label	Description	Channel	Method	Results display
TAD	Transverse Abdominal Diameter	1	Distance (mm)	MA will be displayed only when the measured parameter value is in the valid range of the preset formula.
APAD	Antero Posterior Diameter of the Abdomen	1		
CER	Cerebellum Diameter	1		
FTA	Fetus Trunk cross section Area	1	Ellipse or Trace Area (mm^2 or dm^2)	
HUM	Humerus Length	1	Distance (mm)	
OFD	Occipital Frontal Diameter	1		
THD	Thorax Diameter	1		

The system calculates MA automatically after measuring each parameter. Activate the obstetric measurement function, take GS measurement for instance:

To measure GS (use the Maximum diameter method):

1. Press **Measure** to activate obstetric measurement.
2. In the obstetric menu, roll the trackball to highlight the menu **GS**, press **Set**, and move the cursor to image and display "+".
3. Measure GS, in the method of distance measurement.

Reference

Chapter 6.6.2, B-mode Generic Measurements.

4. The result is displayed in Measured Results.
5. To begin a new GS measurement, repeat steps 1 through 3. You can measure a maximum of one group of data.

The measurements of other parameters are similar to the measurement of GS.

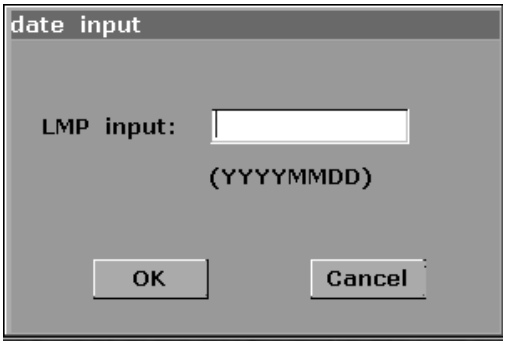
7.4. EDC Calculation

7.4.1. EDC Calculation by LMP

To calculate EDC according to LMP

1. In the obstetric menu, roll the trackball to highlight the menu **Input**, and the system displays the secondary menu automatically, as shown below:

2. Select **LMP** and press **Set**, and the **LMP input** dialog box is displayed on the screen.



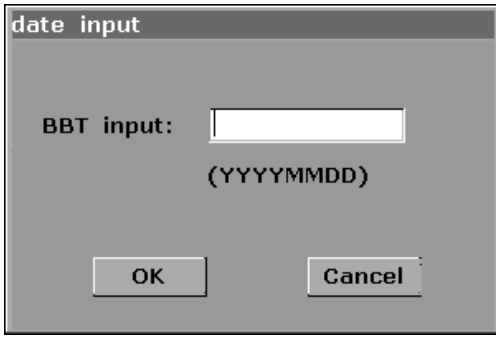
3. Select **OK** and press **Set** to do the calculation automatically, or select **Cancel** to give up the

calculation.

7.4.2. EDC Calculation by BBT

To calculate EDC according to BBT

1. In the obstetric menu, roll the trackball to highlight the menu **Input**, and the system displays the secondary menu automatically.
2. Select BBT in the list of input items and press **Set**, and the **BBT input** dialog box is displayed on the screen.



3. Select **OK** and press **Set** to do the calculation automatically, or select **Cancel** to give up the calculation.

NOTE:

In EDC calculation, make sure that the system date is correct. The default standard pregnancy period in the system is 40 weeks. In the LMP method measuring, if the interval between the input date and the current system date exceeds 40 weeks, the system will not accept the input date. In the BBT method measuring, if the interval between the input date and the current system date exceeds 266 days, the system will not accept the input date.

7.5. EFW Calculation

This system can calculate EFW according to the measured data.

7.5.1. Select a Formula in Preset

This system provides eleven types of EFW formula, as shown below.

Table 7-3 Obstetric Calculation Formula

Options	Formula	
Tokyo	EFW = 1.07* (BPD^3)+3.42*APTD*TTD*FL EFW: g; Others: cm	
Osaka	EFW = 1.25674* (BPD^3)+3.50665*FTA*FL+6.3 EFW: g; FTA: cm^2; Others: cm	
HADLOCK1	EFW = 10^{1.304+ (0.05281*AC)+ (0.1938*FL)- (0.004*FL*AC)}	EFW: g; Others: cm
HADLOCK2	EFW = 10^{1.335- (0.0034*AC*FL)+ (0.0316*BPD)+ (0.0457*AC) + (0.1623*FL) }	
HADLOCK3	EFW = 10^{1.326- (0.00326*AC*FL)+ (0.0107*HC)+ (0.0438*AC) + (0.158*FL) }	
HADLOCK4	EFW = 10^{1.3596- (0.00386*AC*FL)+ (0.0064*HC)+ (0.00061*BPD*AC) + (0.0424*AC)+ (0.174*FL) }	
Shepard	EFW = 10^{-1.7492+ (0.166*BPD)+ (0.046*AC) - (2.646*AC*BPD/1000)} EFW: Kg; Others: cm	
Merz1	EFW = (-3200.40479+ (157.07186*AC)+{15.90391* (BPD^2)}	EFW: g; Others: cm
Merz2	EFW = 0.1* (AC^3)}	
Hansmann	EFW = (-1.05775*BPD+0.0930707* (BPD^2) + {0.649145*THD) - 0.020562* (THD^2) +0.515263	EFW: Kg; Others: cm
Campbell	EFW = EXP{-4.564+ (0.282*AC)-[0.00331* (AC^2)]}	

7.5.2. Measurement Items

Different measurement items go with different formula. So you can select suitable formula according to the measurement item.

Take Osaka formula for instance, to calculate EFW:

1. In the obstetric menu, roll the trackball to highlight menu **EFW**, and press **Set**.
2. Use the distance measurement method to measure BPD.
3. Use the ellipse method to measure FTA.
4. Use the distance measurement method to measure FL, and the result of EFW is displayed in Measured Results.

7.6. Results

Obstetric results include **Growth Curve** and **OB Worksheet**.

7.6.1. Growth Curve

You can define the fetus growth by comparing the measured parameter value with the fetus growth curve.

Operation procedure:

1. Measure one or more fetus growth parameter (GS, CRL, BPD, FL, AC, HC, APAD, TAD, CER, FTA, HUM, OFD, or THD).
2. Enter LMP or BBT.
3. In the obstetric menu, roll the trackball to highlight menu **Results**, and the secondary menu is displayed. Then select **Growth Curve** and press **Set**, and the Fetus Growth Analysis dialog box is displayed in the middle of the screen.
4. The default tab is GS and the corresponding formula of the current growth curve. Move the cursor to another formula and press **Set** to display the normal growth curve based on the selected formula, which can define how the fetus grows.
5. Move the cursor to another tab, and press **Set** to display the growth curve of another measurement item and the phase of the growth corresponding to the measured data.

Take Rempen formula to GS for example, the signification of the growth curve is as shown below, and the x-coordinate shows the phase of the growth corresponding to the entered LMP or BBT, and the y-coordinate shows the measured GS data.

Move the cursor to **Close**, and press **Set** to exit.

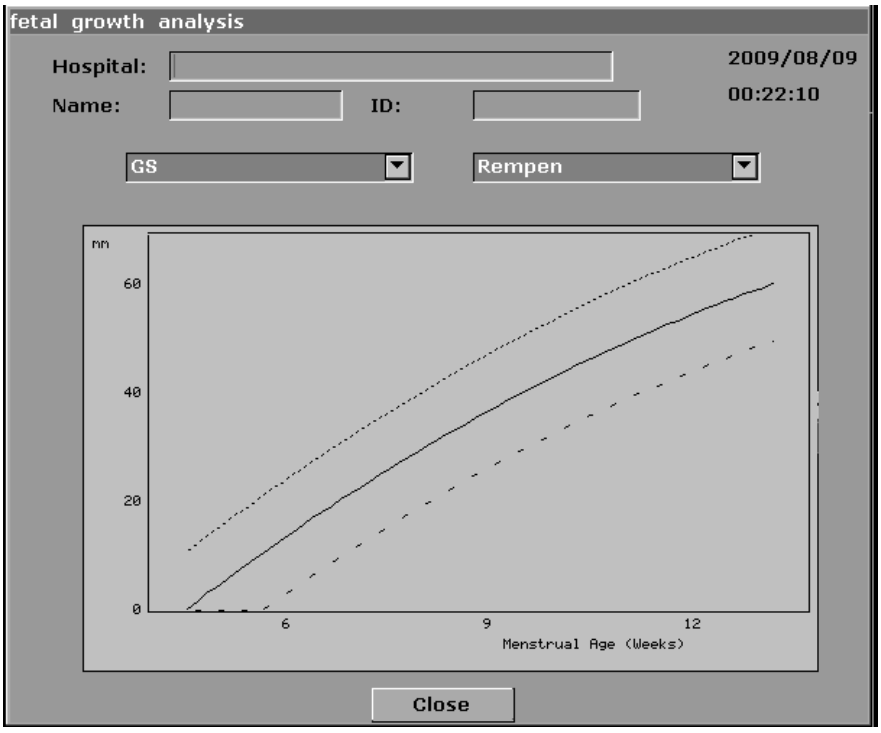


Figure 7-2 Fetal Growth Curve

7.6.2. Obstetric Report

After obstetric examination, the system generates an obstetrical diagnosis worksheet automatically.

1. In the obstetric menu, roll the trackball to highlight **Results**, and the system displays the secondary menu automatically.
2. Select **OB Worksheet** and press **Set** to open dialog box **Obstetric Worksheet**.

The worksheet has three tabs, **OB data**, **OB 1**, and **OB 2**, as shown below:

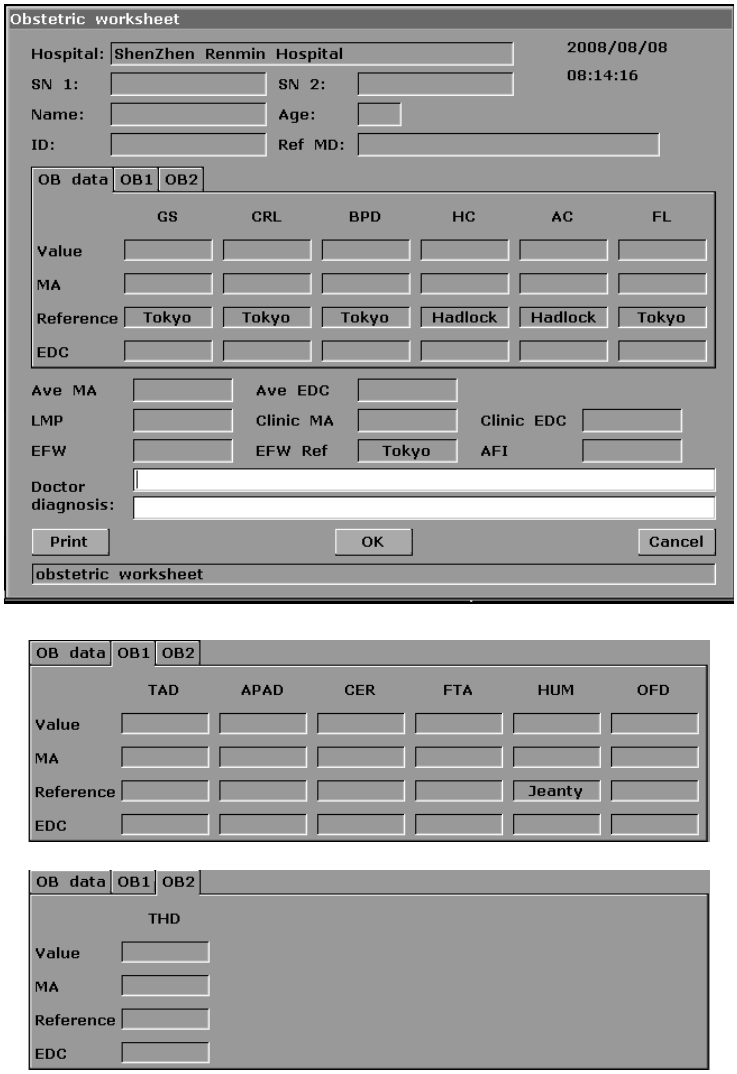


Figure 7-3 Obstetric Worksheet

The diagnosis editing column displays the cursor "I", and you can enter diagnosis information.

NOTE:

1. The system displays the completed measurements and calculations. The uncompleted measurements and calculations are not displayed.
2. You can check the measured items by opening the obstetric worksheet dialog box whenever you want, during measurement or after that. Then press **OK** or **Cancel** to close the dialog box, and continue to measure.

Print the report:

Printing reference Chapter 5.8, Printing.

Obstetrical ultrasound report

Obstetrical Ultrasound Report

Hospital:

Name: ID: Age:

SN 1: SN 2: Ref MD:

Measurement and Calculation Data

Grow Parameter		GA	EDC
GS	mm		
CRL	mm		
BPD	mm		
HC	mm		
AC	mm		
FL	mm		
TAD	mm		
APAD	mm		
CER	mm		
FTA	mm^2		
HUM	mm		
OFD	mm		
THD	mm		

Average GA: Average EDC:

LMP: GA: EDC:

EFW g Formula

Fetal Presentation FHR AFI mm (┼) cm

Placental Pos. Placental Grade

Ultrasonic image

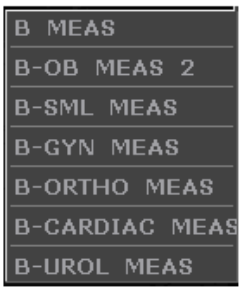
Diagnosis:

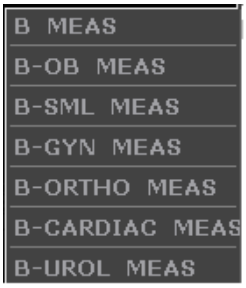
Signature (Seal)

Date

7.7. Others

If you want to begin other measurements, you can switch through the menu by pressing **Others**.

B-OB MEAS >> 

; B-OB MEAS 2 >> 

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Chapter 8 Cardiology Measurement and Calculation

The cardiology examination is usually in the B-mode, the B/M-mode or the M-mode.

Press **Exam** and select **Cardiac**, and then press **Set**.

8.1. M-mode Cardiac Measurement and Calculation

Press to enter the M-mode, or press to enter the B/M mode, and then press **Measure** to activate the measurement function. The measurement menu is displayed.

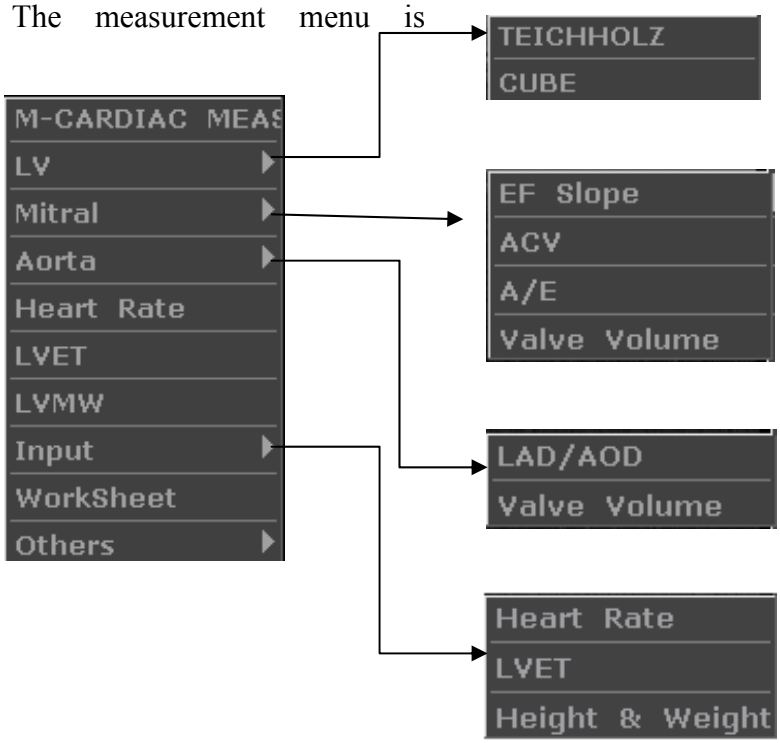


Figure 8-1 M Mode Cardiac Measurement and Calculation Menu

1. Items of Measurement and Calculation

M-CARDIAC MEAS: LV, Mitral, Heart Rate, LVET, and LVMW.

2. Items of input

Heart Rate, LVET, and Height &Weight.

The formulas of B/M-mode and M-mode cardiac LV measurement include TEICHHOLZ and CUBE, as shown below, and the default formula is TEICHHOLZ.

1. CUBE formula:

Table 8-1 Measurement and Calculation Items with CUBE formula

NOTE: d: end diastolic; s: end systolic

Label	Description	Method
LVIDd	Left Ventricle Internal Diameter	Distance (mm)
LVIDs	Left Ventricle Internal Diameter	
ET	Ejection Time	Time (ms or s)
HR	Heart Rate	M-mode heart rate measurement or key in (bpm)
EDV	End Diastolic Volume	EDV (mL) = $LVIDd^3$ (mm^3)/1000
ESV	End Systolic Volume	ESV (mL) = $LVIDs^3$ (mm^3)/1000
SV	Stroke volume	SV (mL) = EDV (mL)-ESV (mL)
CO	Cardiac Output	CO (L/min) = SV (mL) x HR (bpm)/1000
EF	Ejection fraction (M-mode)	EF (No unit) = SV (mL)/ EDV (mL) x 100%
FS	Fractional Shortening	FS (No unit) = [{ LVIDd (mm)- LVIDs (mm)}/ LVIDd (mm)]x 100%
SI	Stroke Index	SI (No unit) = SV (mL)/ BSA (m^2)
CI	Cardiac Index	CI (No unit) = CO (L/min)/ BSA (m^2)
MVCF	Mean Velocity Circumferential Fiber Shortening	MVCF (No unit) = { LVIDd (mm)- LVIDs (mm)}/ {LVIDd (mm) x ET (ms)/1000}
BSA	Body Surface Area	Calculate by the selected formula (m^2)

The formulas of BSA calculation:

Oriental: $BSA=Weight^{0.425}*Height^{0.725}*73.58/10000$

Occidental: $BSA=Weight^{0.425}*Height^{0.725}*71.84/10000$

Height: height cm.

Weight: weight kg.

BSA: body surface area m^2.

1. TEICHHOLZ formula:

Table 8-2 Measurement and Calculation Items with TEICHHOLZ formula

NOTE: d: end diastolic; s: end systolic

Label	Description	Method
LVIDd	Left Ventricle Internal Diameter	Distance (mm)
LVIDs	Left Ventricle Internal Diameter	
ET	Ejection Time	Time (ms or s)
HR	Heart Rate	M-mode heart rate measurement or key in (bpm)
EDV	End Diastolic Volume	EDV (mL) = {7 × LVIDd ^{3} (cm)^3}/{2.4+ LVIDd (cm)}
ESV	End Systolic Volume	ESV (mL) = {7 × LVIDs ^{3} (cm)^3}/{2.4+ LVIDs (cm)}
SV	Stroke volume	SV (mL) = EDV (mL)-ESV (mL)
CO	Cardiac Output	CO (L/min) = SV (mL) × HR (bpm)/1000
EF	Ejection fraction (M-mode)	EF (No unit) = SV (mL)/ EDV (mL) ×100%
FS	Fractional Shortening	FS (No unit) = [{ LVIDd (mm)- LVIDs (mm)}/ LVIDd (mm)] ×100%
SI	Stroke Index	SI (No unit) = SV (mL)/ BSA (m^2)
CI	Cardiac Index	CI (No unit) = CO (L/min)/ BSA (m^2)
MVCF	Mean Velocity Circumferential Fiber Shortening	MVCF (No unit) = {LVIDd (mm)- LVIDs (mm)}/ {LVIDd (mm) x ET (ms)/1000}
BSA	Body Surface Area	Calculate by the selected formula (m^2)

2. Other measurement items:

Table 8-3 Other Measurement Items

Label	Description	Method
AOD	Aortic root Diameter	Distance (mm)
LAD	Left Atrium Diameter	
CA	Cardiac cycle apex A	
CE	Cardiac cycle apex E	
EF SLP	Ejection Fraction Slope	Slope (mm/s)
ACV	AC Decreasing Velocity	
DEV	Deceleration Velocity	
DCT	Deceleration Time	Time (ms or s)
MAVO1	Aortic Valve Volume Opened, beginning	Distance (mm)
MAVO2	Aortic Valve Volume Opened, ending	
AA	Aortic Amplitude	
LVMW	Left Ventricular Muscle Weight	LVMW (g) =1.04* ({IVSTd (cm)+LVIDd (cm)+LVPWd (cm)}^{3}-LVIDd^3 (cm)^3)-13.6
LVMWI	Left Ventricular Muscle Weight Index	LVMWI (No unit) = LVMW/BSA
A/E	The ratio of CA to CE	A/E (No unit) = CA (mm)/CE (mm)
LAD/AOD	Left Atrium Diameter / Aortic root Diameter	LAD/AOD (No unit) = LAD (mm) / AOD (mm)
AVSV	Aortic Valve Stoma Valve flow	AVSV (mL) = MAVO1 (cm)+MAVO2 (cm)* ET (s)*50+AA (cm)
QMV	Mitral Valve Flow	QMV (mL) = 4*DEV (cm/s)*DCT (s)

3. Calculation items:

Table 8-4 Calculation Items

Label	Description	Method
EDV	End Diastolic Volume	EDV (mL) = $LVIDd^3$ (mm^3)/1000 CUBE formula
ESV	End Systolic Volume	ESV (mL) = $LVIDs^3$ (mm^3)/1000 CUBE formula
SV	Stroke volume	SV (mL) = EDV (mL)-ESV (mL)
CO	Cardiac Output	CO (L/min) = SV (mL) × HR (bpm)/1000
EF	Ejection fraction (M-mode)	EF (No unit) = SV (mL)/ EDV (mL) × 100%
FS	Fractional Shortening	FS (No unit) =[{LVIDd (mm)- LVIDs (mm)}/ LVIDd (mm)]x 100%
SI	Stroke Index	SI (No unit)= SV (mL)/ BSA (m^2)
CI	Cardiac Index	CI (No unit)= CO (L/min)/ BSA (m^2)
MVCF	Mean Velocity Circumferential Fiber Shortening	MVCF (No unit)= { LVIDd (mm)- LVIDs (mm)}/ {LVIDd (mm) × ET (ms)/1000}
BSA	Body Surface Area (m^2)	Calculate by to the selected formula
LVMW	Left Ventricular Muscle Weight	LVMW (g)=1.04*[{IVSTDd (cm)+LVIDd (cm) + $LVPWd^3$ (cm)}^{3}-$LVIDd^3$ $(cm)^3$]-13.6
LVMWI	Left Ventricular Muscle Weight Index	LVMWI (No unit)=LVMW/BSA
A/E	The ratio of CA to CE	A/E (No unit)= CA (mm)/CE (mm)
LAD/AOD	Left Atrium Diameter / Aortic root Diameter	LAD/AOD (No unit)= LAD (mm)/AOD (mm)
AVSV	Aortic Valve Stoma Valve flow	AVSV (mL)=MAVO1 (cm)+MAVO2 (cm)* ET (s)*50+AA (cm)
QMV	Mitral Valve Flow	QMV (mL)=4*DEV (cm/s)*DCT (s)

8.1.1. LV

The B/M-mode and M-mode measurements of LV are based on ESV and EDV, which are calculated by LVIDs and LVIDd measurements respectively.

After measuring LVIDs and LVIDd and entering Heart Rate, LVET, and Height & Weight, the system can calculate some physiological parameters, such as ESV, EDV, SV, EF, FS, CO, MVCF, SI, and CI.

There are two calculation formulas for heart antrum volume in the B/M-mode and the M-mode, as shown below.

Table 8-5 TEICHHOLZ and CUBE Formula

Item	Formula
TEICHHOLZ	EDV (mL)= 7 x $LVIDd^3$ (cm^3)/{2.4 + LVIDd (cm)} ESV (mL)= 7 x $LVIDs^3$ (cm^3)/{2.4 + LVIDs (cm)}
CUBE	EDV (mL) = $LVIDd^3$ ($mm)^3$ / 1000 ESV (mL) = $LVIDs^3$ ($mm)^3$ / 1000

NOTE:

Ensure that the value of LVIDd is bigger than that of LVIDs, or the system can not display the calculation items.

SV and EF calculation is as below.

- Measurement items:

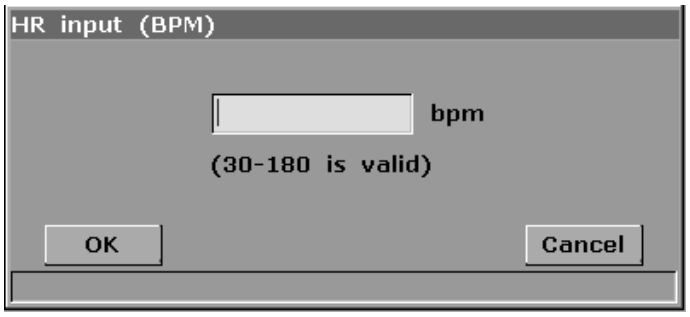
  LVIDs and LVIDd

- To measure LV:

1. In the M-cardiac measurement menu, roll the trackball to highlight **LV**, and the secondary menu is displayed. Select TEICHHOLZ or CUBE and press **Set**. Then move the cursor to the image area and a "+" is displayed.
2. Move the cursor to the end systolic of left ventricle, and measure LVIDs. The method is similar to generic M-mode distance measurement. LVIDs and ESV are displayed in Measured Results.
3. Move the cursor to the end diastolic of the left ventricle, and measure LVIDd. The method is similar to generic M-mode distance measurement. LVIDd, EDV, SV, EF, and FS are displayed in Measured Results.

◆ Enter HR

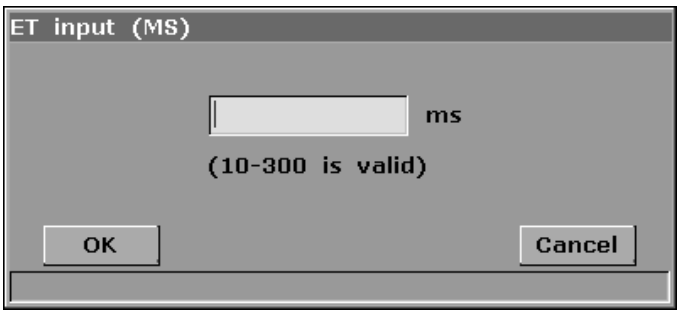
1. In the M-cardiac measurement menu, roll the trackball to highlight **Input**, select the secondary menu **Heart Rate** and press **Set** to display a **HR input** dialog box, as shown below.



2. Input a suitable value in the HR box .
3. Roll the trackball to highlight **OK** and press **Set**, and after measuring LV, the result of CO is displayed in Measured Results.

◆ Enter LVET

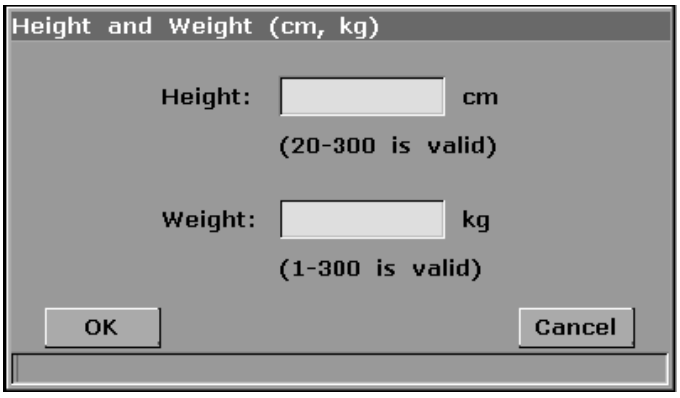
1. In the M-cardiac measurement menu, roll the trackball to highlight **Input**, select the secondary menu **LVET** and press **Set** to display an **ET input** dialog box, as shown below.



2. Input a suitable value in the LVET box.
3. Roll the trackball to highlight **OK** and press **Set**.

◆ Enter Height and Weight

1. In the M-cardiac measurement menu, roll the trackball to highlight **Input**, select the secondary menu **Height & Weight** and press **Set** to display a **Height and Weight** entering dialog box, as shown below.



2. Input suitable values in the Height and Weight boxes.

3. Roll the trackball to highlight **OK** and press **Set**.

The measurements and calculations of all the LV parameters are as below.

- Measurement or input items:

Input or measurement: HR, LVET and patient's Height & Weight;

Measurement: LVIDs and LVIDd

- To calculate all the LV parameters:

1. Input or measure HR, LVET, and Height & Weight.
2. Measure LVIDs and LVIDd following the prompt instruction.
3. All the LV parameters, ESV, EDV, SV, FS, EF, CO, MVCF, SI and CI are displayed in Measured Results.

8.1.2. Mitral Valve

Mitral Valve calculation is as below.

- Measurement items:

EF slope, ACV, A/E, DEV, and DCT

- Mitral Valve measurement:

In the M-cardiac measurement menu, roll the trackball to highlight **Mitral** to display the secondary menu.

✧ **To measure EF slope, ACV, and A/E**

1. Roll the trackball to highlight **EF Slope**, **ACV**, or **A/E**, and press **Set**.
2. The method of measuring **EF Slope** and **ACV** is similar to the generic M-mode slope measurement method.
3. To measure **A/E**, measure the breadth from apex A to point C and the breadth from apex E to point C respectively. The method is similar to the generic M-mode distance measurement method.
4. After the measurement the result of EF SLP, ACV and A/E are displayed in Measured Results respectively.

✧ **To measure Valve Volume (QMV)**

Calculation formula:

QMV (mL) = 4*DEV (cm/s)*DCT (s)

Measurement operation procedure:

1. Roll the trackball to highlight **Valve Volume**, and press **Set**.

2. Measure DEV. The method is similar to the generic M-mode slope measurement method.
3. Measure DCT. The method is similar to the generic M-mode time measurement method.
4. After the measurement, the result of QMV is displayed in Measured Results.

8.1.3. Aortia

Aortia calculation is as below.

- Measurement items:

LAD/ AOD and Valve Volume

- Aortia calculation

In the M-cardiac measurement menu, roll the trackball to highlight **Aortia** to display the secondary menu.

✧ **LAD/AOD measurement**

1. Roll the trackball to highlight **LAD/AOD** and press **Set**.
2. Measure LAD and AOD respectively. The method is similar to the generic M-mode distance measurement method.
3. The result is displayed in Measured Results.

✧ **AVSV measurement**

The calculation formula:

AVSV (mL) = MAVO1 (cm)+MAVO2 (cm)*ET (s)*50+AA (cm)

The measurement operation procedure:

1. Roll the trackball to highlight **Valve Volume** and press **Set**.
2. Measure MAVO1. The method is similar to the generic M-mode distance measurement method.
3. Measure MAVO2. The method is similar to the generic M-mode distance measurement method.
4. Measure AA. The method is similar to the generic M-mode distance measurement method.
5. Measure LVET. The method is similar to the generic M-mode time measurement method.
6. After the measurement, the result of AVSV is displayed in Measured Results.

8.1.4. LVMW, LVMWI

LVMW and LVMWI calculations are as below.

- Measurement items:

LVPWd, IVSTd and LVIDd

- The calculation formula

LVMW (g) = 1.04*[{IVSTd (cm) +LVIDd (cm) +LVPWd (cm)}^{3}-LVIDd^3 (cm)^3]-13.6

LVMWI = LVMW (g)/BSA (m)^2

- To calculate LVMW, LVMWI

1. In the M-cardiac measurement menu, roll the trackball to highlight **LVMW**, and press **Set**.
2. Measure LVPWd, IVSTd and LVIDd respectively following the prompt instruction.
3. After the measurements, the result of LVMW is displayed in Measured Results. The system displays LVWMI if you have keyed in Height and Weight before the measurement. If you measured LV before, the system renovates the LV results.

8.2. B-mode Cardiac Measurement and Calculation

Press **Exam** to select cardiology and press **Set**.

In the B-mode, press **Measure**, the system enables B-mode cardiac measurement. The B-mode cardiac measurement menus are as shown below:

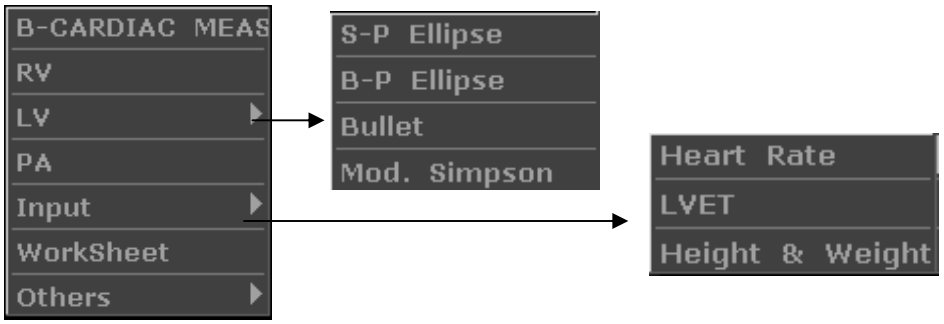


Figure 8-2 B Mode Cardiac Measurement and Calculation Menu

1. Items of Measurement and Calculation

B-CARDIAC MEAS: RV, LV, and PA.

2. Items of input

Heart Rate, LVET, and Height & Weight.

The default measurements are LVLs, LVALs, LVLd, and LVALd measurements with single-plane ellipse.

The formulas of B-mode cardiac LV measurement include Single plane ellipse, Dual plane ellipse, Bullet, and Modified Simpson, as shown below:

1. **Single plane ellipse formula:**

Table 8-6 Measurement and Calculation Items with Single Plane Ellipse Formula

NOTE: d: end diastolic; s: end systolic

Label	**Description**	**Method**
LVLd	Left Ventricle Long-axle Diameter	Distance (mm)
LVALd	Left Ventricle Area of Long-axle	Ellipse Area (mm^2, cm^2, or dm^2)
LVLs	Left Ventricle Long-axle Diameter	Distance (mm)
LVALs	Left Ventricle Area of Long-axle	Ellipse Area (mm^2, cm^2, or dm^2)
HR	Heart Rate	Key in (bpm)
EDV	End Diastolic Volume	EDV (mL)= $(8/3/\pi) \times \{LVALd\ (mm^2)\}^2 / LVLd$ (mm) /1000
ESV	End Systolic Volume	ESV (mL)= $(8/3/\pi) \times \{LVALs\ (mm^2)\}^2 / LVLs$ (mm) /1000
SV	Stroke volume	SV (mL)=EDV (mL)-ESV (mL)
CO	Cardiac Output	CO (L/min)= SV (mL) × HR (bpm)/1000
EF	Ejection fraction (B-mode)	EF (No unit)= SV (mL)/ EDV (mL) x 100%
SI	Stroke Index	SI (No unit)= SV (mL)/ BSA (m^2)
CI	Cardiac Index	CI (No unit)= CO (L/min)/ BSA (m^2)
BSA	Body Surface Area	Calculate by the selected formula (m^2)

2. Dual plane ellipse formula:

Table 8-7 Measurement and Calculation Items with Dual Plane Ellipse Formula

NOTE: d: end diastolic; s: end systolic

Label	Description	Method
LVALd	Left Ventricle Area of Long-axle	Ellipse Area (mm^2, cm^2, or dm^2)
LVAMd	Left Ventricular Fractional Area of Mitral Valve	
LVIDd	Left Ventricle Internal Diameter	Distance (mm)
LVALs	Left Ventricle Area of Long-axle	Ellipse Area (mm^2, cm^2, or dm^2)
LVAMs	Left Ventricular Fractional Area of Mitral Valve	
LVIDs	Left Ventricle Internal Diameter	Distance (mm)
HR	Heart Rate	Key in (bpm)
EDV	End Diastolic Volume	EDV (mL)= $(8/3/\pi)\times\{LVALd\ (mm^2)\}^2/LVLd$ (mm) /1000
ESV	End Systolic Volume	ESV (mL)= $(8/3/\pi)\times\{LVALs\ (mm^2)\}^2/LVLs$ (mm) /1000
SV	Stroke volume	SV (mL)=EDV (mL)-ESV (mL)
CO	Cardiac Output	CO (L/min)= SV (mL) × HR (bpm)/1000
EF	Ejection fraction (B-mode)	EF (No unit)= SV (mL)/ EDV (mL) x 100%
SI	Stroke Index	SI (No unit)= SV (mL)/ BSA (m^2)
CI	Cardiac Index	CI (No unit)= CO (L/min)/ BSA (m^2)
BSA	Body Surface Area	Calculate by the selected formula (m^2)

3. Bullet volume formula:

Table 8-8 Measurement and Calculation Items with Bullet Formula

NOTE: d: end diastolic; s: end systolic

Label	Description	Method
LVAMd	Left Ventricular Fractional Area of Mitral Valve	Ellipse Area (mm^2, cm^2, or dm^2)
LVLd	Left Ventricular Length	Distance (mm)
LVAMs	Left Ventricular Fractional Area of Mitral Valve	Ellipse Area (mm^2, cm^2, or dm^2)
LVLs	Left Ventricular Length	Distance (mm)
HR	Heart Rate	Key in (bpm)
EDV	End Diastolic Volume	EDV (mL)= (5/6)×LVLd (mm)×LVAMd (mm^2) /1000
ESV	End Systolic Volume	ESV (mL)= (5/6)×LVLs (mm)× LVAMs (mm^2) /1000
SV	Stroke volume	SV (mL)=EDV (mL)-ESV (mL)
CO	Cardiac Output	CO (L/min)= SV (mL) × HR (bpm)/1000
EF	Ejection fraction (B-mode)	EF (No unit)= SV (mL)/ EDV (mL) x 100%
SI	Stroke Index	SI (No unit)= SV (mL)/ BSA (m^2)
CI	Cardiac Index	CI (No unit)= CO (L/min)/ BSA (m^2)
BSA	Body Surface Area	Calculate by the selected formula (m^2)

4. Modified SIMPSON formula:

Table 8-9 Measurement and Calculation Items with Modified SIMPSON Formula

NOTE: d: end diastolic; s: end systolic

Label	Description	Method
LVAMd	Left Ventricular Fractional Area of Mitral Valve	Ellipse Area (mm^2, cm^2, or dm^2)
LVLd	Left Ventricular Length	Distance (mm)
LVAPd	Left Ventricular Fractional Area of Papillary Muscles	Ellipse Area (mm^2, cm^2, or dm^2)
LVAMs	Left Ventricular Anterior Wall	
LVLs	Left Ventricular Length	Distance (mm)
LVAPs	Left Ventricular Fractional Area of Papillary Muscles	Ellipse Area (mm^2, cm^2, or dm^2)
HR	Heart Rate	Key in (bpm)
EDV	End Diastolic Volume	*1
ESV	End Systolic Volume	
SV	Stroke volume	SV (mL)=EDV (mL)-ESV (mL)
CO	Cardiac Output	CO (L/min)= SV (mL) x HR (bpm)/1000
EF	Ejection fraction (B-mode)	EF (No unit)= SV (mL)/ EDV (mL) x 100%
SI	Stroke Index	SI (No unit)= SV (mL)/ BSA (m^2)
CI	Cardiac Index	CI (No unit)= CO (L/min)/ BSA (m^2)
BSA	Body Surface Area	Calculate by to the selected formula (m^2)

*1

$$EDV(mL)= LVLd(mm)/9\times\{ 4\times LVAMd(mm2) +2\times LVAPd(mm2)+ \sqrt{LVAMd(mm2) \times LVAPd(mm2)}\} /1000$$

$$ESV(mL)= LVLs(mm)/9\times\{ 4\times LVAMs(mm2) +2\times LVAPs(mm2)+ \sqrt{LVAMs(mm2) \times LVAPs(mm2)}\} /1000$$

5. Other measurement and calculation items:

Table 8-10 Other Measurement and Calculation Items

Label	Description	Method
LVET	Left Ventricular Ejection Time	Time (ms)
FS	Fractional Shortening	FS (No unit)={ LVIDd (mm)- LVIDs (mm)}/ LVIDd (mm) x 100%
MVCF	Mean Velocity Circumferential Fiber Shortening	MVCF (No unit)= { LVIDd (mm)- LVIDs (mm)}/ {LVIDd (mm) x ET (ms)/1000}

8.2.1. LV

LV measurement is as below.

Single plane ellipse

- Measurement items:

  LVLs, LVALs, LVLd, and LVALd.

- To measure LV:

1. In the B-cardiac measurement menu, roll the trackball to highlight **LV**. Then select **S-P Ellipse** and press **Set**.
2. During end systolic, measure LVLs and LVALs respectively. The system calculates and displays ESV value.
3. During end diastolic, measure LVLd and LVALd respectively, the method of former one is similar to the generic B-mode distance measurement method and the second one, the generic B-mode ellipse area measurement method. The system calculates and displays EDV, SV, and EF.

Dual plane ellipse, Bullet, and Modified SIMPSON

The operations in these methods are similar to those in the single plane ellipse method. Please refer to the corresponding B-mode generic measure method for details, and you can use the prompt instruction to help you.

CO calculation is as below.

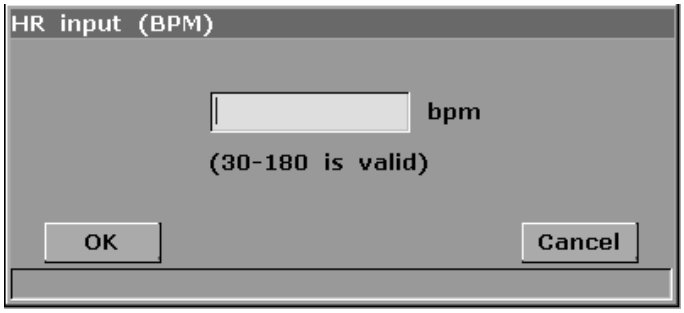
- Measurement and input items:

  Measure LV;

  Key in: HR

- To calculate CO:

1. In the B-cardiac measurement menu, roll the trackball to highlight **Input**, select the secondary menu **Heart Rate** and press **Set** to display a **HR input** dialog box, as shown below.



2. Input a suitable value in the HR box.
3. Roll the trackball to highlight **OK** and press **Set**. After measuring LV, CO are displayed in Measured Results.

MVCF calculation is as below.

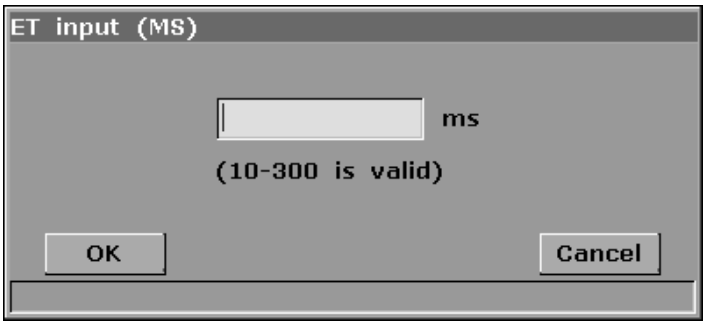
- Measurement and input items:

  Measure: LV;

  Key in: LVET

- To calculate MVCF:

1. Move the cursor to **Input**, select the secondary menu **LVET** and press **Set** to display an **ET input** entering dialog box, as shown below.



2. Input a suitable value in the LVET box.
3. Roll the trackball to highlight **OK** and press **Set**. After measuring LV, MVCF are displayed in Measured Results.

CI and SI calculations are as below.

- Measurement and input items:

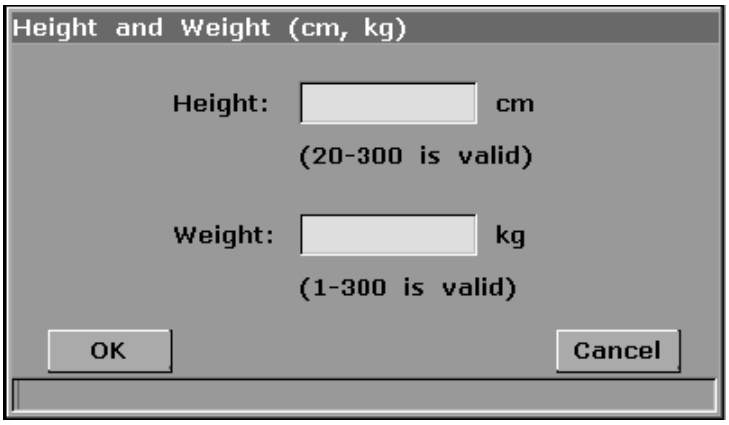
  Measure: LV and HR;

  Key in: Height and Weight

- To calculate CI and SI:

1. In the B-cardiac measurement menu, roll the trackball to highlight **Input**, select the secondary menu **Height & Weight** and press **Set** to display a **Height and Weight** entering dialog box,

as shown below.



2. Input suitable values in the Height and Weight boxes.
3. Roll the trackball to highlight **OK** and press **Set**. BSA is displayed in Measured Results. After measuring LV and HR, SI and CI are also displayed in Measured Results.

8.2.2. RV (Right ventricle internal diameter)

1. In the B-cardiac measurement menu, roll the trackball to highlight **RV**.
2. Measure RV with distance method.
3. The result is displayed in Measured Results.

8.2.3. PA (Aortic Pulmonary Artery)

1. In the B-cardiac measurement menu, roll the trackball to highlight **PA**, and press **Set** to display a "+" in the image area.
2. Measure **PA** with distance measurement method.
3. The result is displayed in Measured Results.

Other parameters:

If you want to do other cardiac parameter measurement, please enter B/M-mode or M-mode cardiac measurement.

The result of ventricle volume measurement is more exact in two-dimension. You can get the two-dimension heart image of end diastolic and end systolic exactly and conveniently in the B/M-mode. So we suggest that you can do the cardiac measurement and calculation in the B/M-mode.

8.3. Cardiac Report

After the cardiac examination, the system generates a cardiology examination and diagnosis worksheet. Roll the trackball to highlight **Worksheet**, and press **Set** to display **Cardiac Worksheet** dialog box, as shown below.

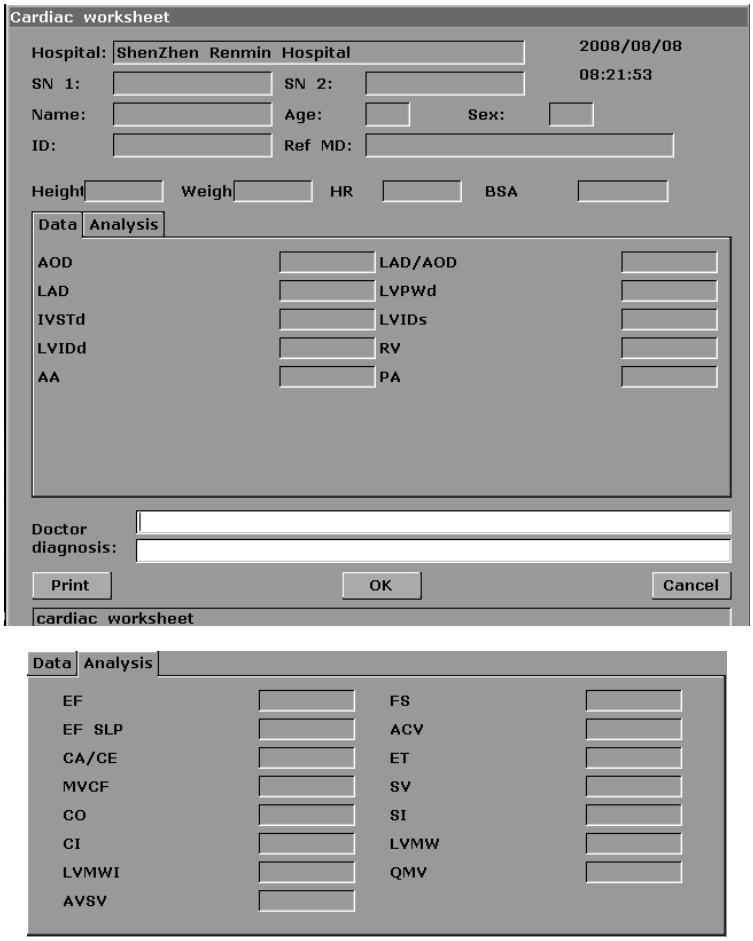


Figure 8-3 Cardiac Worksheet

The diagnosis editing column displays the cursor "I", and you can enter diagnosis information.

Print the report:

Printing reference

Chapter 5.8, Printing.

Cardiac ultrasound report

Cardiac Ultrasound Report

Hospital:

Name: ID: Age: Sex:

SN 1: SN 2: Ref MD:

Height	mm	Weight	g
HR	bpm	BSA	mm^2

Measurement and Calculation Data

AOD	mm	LAD/LCD	mm
LAD	mm	LVPWd	mm
IVSTd	mm	LVIDs	mm
IVIDd	mm	RV	mm
AA	mm	PA	mm
EF	%	FS	%
EF SLP	mm/s	ACV	mm/s
A/E		ET	ms
MVCF		SV	mm^3
CO	L/Min	SI	
CI		LVMW	g
LVMWI		QMV	
AVSV	mm^3		

Ultrasonic image

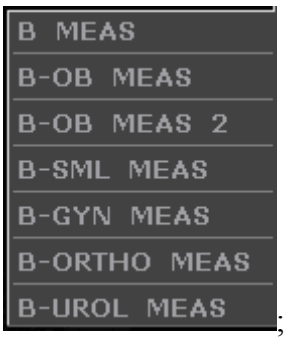
Diagnosis:

Signature (Seal)

Date

8.4. Others

If you want to begin other measurements, you can switch through the menu by pressing **Others**.

B CARDIAC MEAS >> 

;

M CARDIAC MEAS >>

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Chapter 9 Gynecology Measurement and Calculation

9.1. Measurement and Calculation

The gynecology examination is usually in the B-mode.

1. Press **Exam** and select **Gynecology**, and then press **Set**.
2. Press to enter the B-mode.
3. Press **Measure** to activate the measurement function. The measurement menu is displayed.

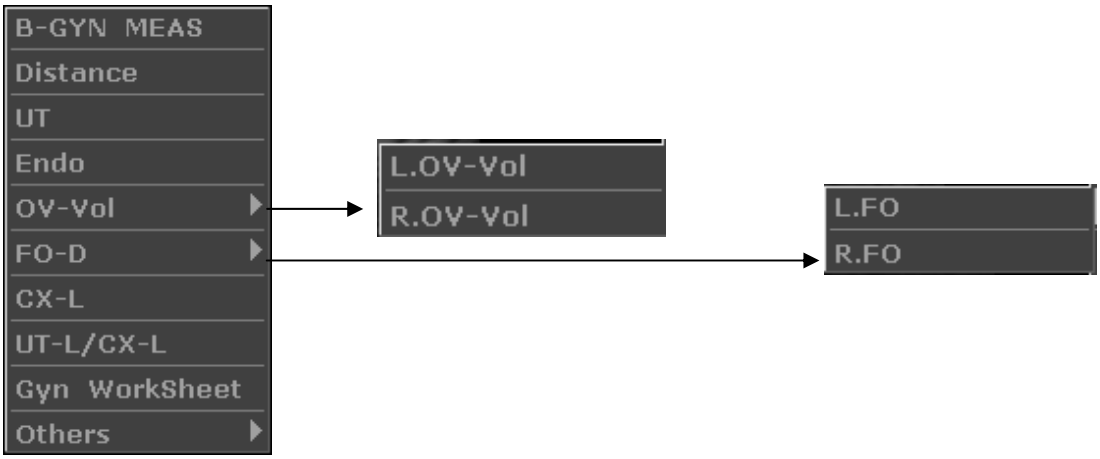


Figure 9-1 Gynecology Measurement and Calculation Menu

To determine the volume of right ovary or left ovary, take three measurements: length, width, and height. The system calculates the volume.

The gynecology measurement items of B-mode are as follows.

Table 9-1 Gynecology Measurement and Calculation Items

Label	Description	Method
UT	Uterus	UT (mm) = UT-L (mm)+UT-W (mm)+UT-H (mm)
UT-L UT-W UT-H	Uterus Length Uterus width Uterus Height	Distance (mm)
Endo	Uterus Endo- membrane Thickness	Distance (mm)
L. OV-Vol	Left Ovary Volume	L. OV-V (mL) = 0.523 x L. OV-L (mm) x L. OV-W (mm) x L. OV-H (mm)/1000
L. OV-L L. OV-W L. OV-H	Left Ovary Length Left Ovary Width Left Ovary Height	Distance (mm)
R. OV-Vol	Right Ovary Volume	R. OV-V (mL) = 0.523 x R. OV-L (mm) x R. OV-W (mm) x R. OV-H (mm)/1000
R. OV-L R. OV-W R. OV-H	Right Ovary Length Right Ovary Width Right Ovary Height	Distance (mm)

L. FO-L L. FO-W	Left Follicle Length Left Follicle Width	
R. FO-L R. FO-W	Right Follicle Length Right Follicle Width	
CX-L	Cervix Length	
UT-L/CX-L	The ratio of Uterus Length And Cervix Length	UT-L/CX-L Ratio

9.1.1. UT

To measure UT:

1. In the gynecology menu, roll the trackball to highlight **UT** and press **Set**.
2. Measure the three data, UT-L, UT-W and UT-H, in the method of distance measurement.
3. After the three data are measured, the result of UT is displayed in Measured Results. You can measure a maximum of one group of data.

9.1.2. Endo

To measure endometrium:

1. In the gynecology menu, roll the trackball to highlight **Endo** and press **Set**.
2. Measure Endo, in the method of distance measurement.
3. The result of Endo is displayed in Measured Results. You can measure a maximum of one group of data.

9.1.3. OV-V

The measurement of OV-Vol includes L.OV-Vol and R.OV-Vol.

To measure L.OV-Vol:

1. In the gynecology menu, roll the trackball to highlight **OV-Vol**, and then highlight the secondary menu **L.OV-Vol**, press **Set**.
2. Measure the three data, L.OV-L, L.OV-W and L.OV-H, in the method of distance measurement.
3. After the three data are measured, the result of L.OV-Vol is displayed in Measured Results.

To measure R.OV-Vol:

The method is similar to the L.OV-Vol measurement method.

9.1.4. FO

The measurement of FO includes L. FO and R. FO.

To measure L. FO:

1. In the gynecology menu, roll the trackball to highlight **FO**, and then highlight the secondary menu **L. FO**, press **Set**.
2. Measure the two data, L. FO-L and L. FO-W, in the method of distance measurement.
3. After the two data are measured, the result of **L. FO** is displayed in Measured Results.

To measure R. FO:

The method is similar to the L. FO measurement method.

9.1.5. CX-L

To measure CX-L:

1. In the gynecology menu, roll the trackball to **CX-L**, and press **Set**.
2. Measure **CX-L** with distance method.
3. The result is displayed in Measured Results, if you have already measured UT-L, the UT-L/CX-L is displayed.

9.1.6. UT-L/CX-L

To measure UT-L/CX-L:

1. In the gynecology menu, roll the trackball to highlight **UT-L/CX-L**, and press **Set**.
2. UT-L/CX-L measurement includes two data: UT-L and CX-L, in the method of distance measurement.
3. The result is displayed in Measured Results.

NOTE:

During measurement, if you have already measured any one of the items, UT-L or CX-L, when you finished the other one, the UT-L/CX-L is displayed automatically.

9.2. Gynecologic Report

After the gynecologic examination, the system generates a gynecologic worksheet.

Roll the trackball to highlight **Worksheet**, and press **Set** to display **Gynecologic Worksheet** dialog box. Gynecologic worksheet has three tabs, uterus, ovary, and follicle, as shown below.

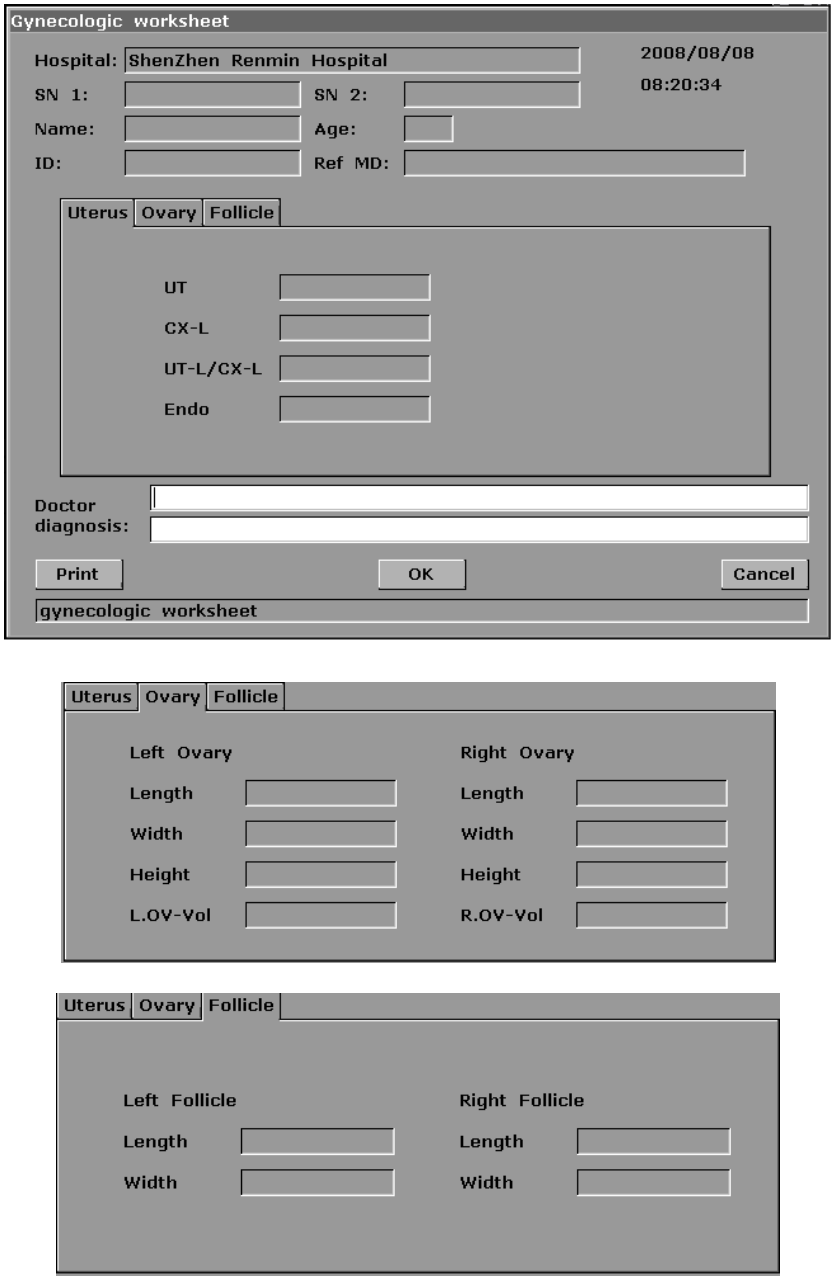


Figure 9-2 Gynecology Worksheet

The diagnosis editing column displays the cursor "I", and you can enter diagnosis information.

Print the report:

Printing reference

Chapter 5.8, Printing.

Gynecology ultrasound report

Gynecology Ultrasound Report

Hospital:

Name: ID: Age:

SN 1: SN 2: Ref MD:

Route: Tae/Tpe/Tre

LMP: Gravida: Abortus:

Para: Ectopic:

Uterine:

UT:	mm	CX-L:	mm
UT-L/CX-L:	mm		
Endo:	mm		

Ovary:

Left side		Right side	
L. OV-L:	mm	R. OV-L:	mm
L. OV-W:	mm	R. OV-W:	mm
L. OV-H:	mm	R. OV-H:	mm
L. OV-V:	mm^3	R. OV-V:	mm^3

FO:

Left side		Right side	
L. FO-L:	mm	R. FO-L:	mm
L. FO-W:	mm	R. FO-W:	mm

Ultrasonic image

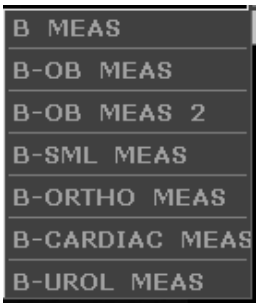
Diagnosis:

Signature (Seal)

Date

9.3. Others

If you want to begin other measurements, you can switch through the menu by pressing **Others**.



Chapter 10 Small Parts Measurement and Calculation

The abbreviations used in this manual are as shown below:

THY: Thyroid gland

THY-V: Thyroid gland Volume

10.1. Measurement and Calculation

The small parts examination is usually in the B-mode.

1. Press **Exam** and select **Small Parts**, and then press **Set**.
2. Press to enter the B-mode.
3. Press **Measure** to activate the measurement function. The measurement menu is displayed in Measured Results. The default measurement is distance measurement.

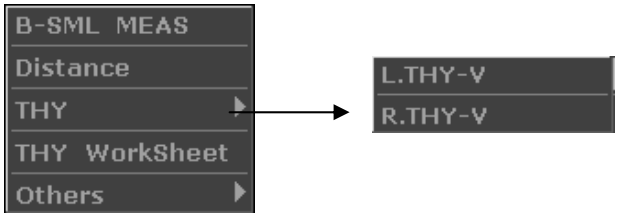


Figure 10-1 Small Parts Measurement and Calculation Menu

To determine the right thyroid gland volume or left thyroid gland volume, take three measurements: length, width, and height. The system calculates the volume.

The measurement items of small parts of B-mode are as follows.

Table 10-1 Small Parts Measurement and Calculation Items

Label	Description	Method
THY	Thyroid Gland	/
L. THY-V	Left Thyroid Gland Volume	L. THY-V (mm^3) = 0.497 × L. THY-L (mm) × L. THY-W (mm) × L. THY-H (mm)
L. THY-L L. THY-W L. THY-H	Left Thyroid Gland Length Left Thyroid Gland Width Left Thyroid Gland Height	Distance (mm)
R. THY-V	Right Thyroid Gland Volume	R. THY-V (mm^3) = 0.497 x R. THY-L (mm) × R. THY-W (mm) × R. THY-H (mm)
R. THY-L R. THY-W R. THY-H	Right Thyroid Gland Length Right Thyroid Gland Width Right Thyroid Gland Height	Distance (mm)

The measurements of THY include L.THY-V and R.THY-V.

To measure L.THY-V:

1. In the small parts menu, roll the trackball to highlight **THY-V**, and then highlight the

secondary menu **L.THY-V**, press **Set**.

2. Measure the threes data: L.THY-L, L.THY-W and L.THY-H, with distance measurement method.
3. After the three data are measured, the result of L.THY-V is displayed in Measured Results.

To measure R. THY-V:

The method is similar to the L.THY-V measurement method.

10.2. Small Parts Report

After the small parts examination, the system generates a THY worksheet.

Roll the trackball to highlight **THY Worksheet**, and press **Set** to display **Small Parts Worksheet** dialog box, as shown below.

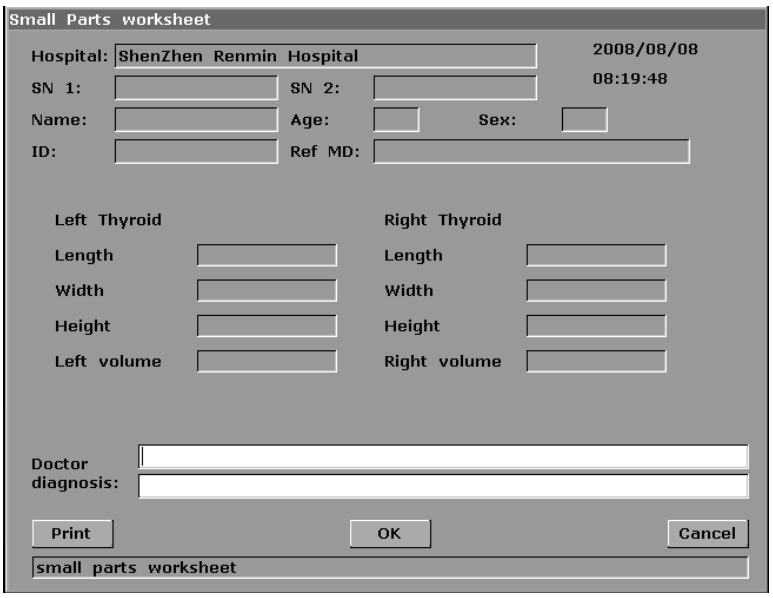


Figure 10-2 Small Parts Worksheet

The diagnosis editing column displays the cursor "I", and you can enter diagnosis information.

Print the report:

Printing reference

Chapter 5.8, Printing.

Thyroid ultrasound report

Thyroid Ultrasound Report

Hospital:

Name: ID: Age: Sex:

SN 1: SN 2: Ref MD:

Thyroid

Left side		Right side	
L. THY-L:	mm	R. THY-L:	mm
L. THY-W:	mm	R. THY-W:	mm
L. THY-H:	mm	R. THY-H:	mm
L. THY-V:	mm^3	R. THY-V:	mm^3

Ultrasonic image

Diagnosis:

Signature (Seal)

Date

10.3. Others

If you want to begin other measurements, you can switch through the menu by pressing **Others**.

Chapter 11 Urology Measurement and Calculation

The abbreviations used in this manual are as shown below:

RUV: Residual urine volume

PV: prostate volume

11.1. Measurement and Calculation

The urology examination is usually in the B-mode.

1. Press **Exam** and select **Urology**, and then press **Set**.
2. Press to enter the B-mode.
3. Press **Measure** to activate the measurement function. The measurement menu is displayed.

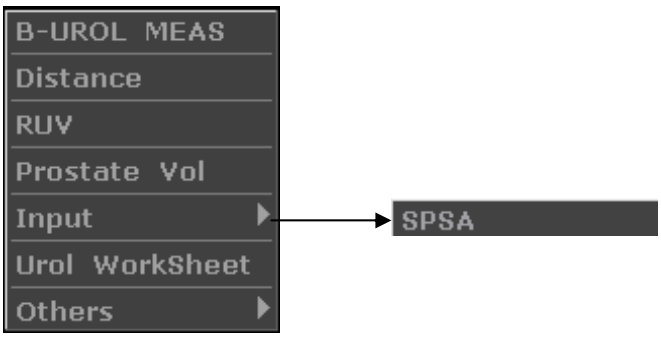


Figure 11-1 Urology Measurement and Calculation Menu

Table 11-1 Urology Measurement and Calculation Items

Label	Description	Method
RUV	Residual Urine Volume (mL or L)	RUV (mL) = 0.7x RUV-L (mm) × RUV-W (mm) × RUV-H (mm) /1000
RUV-L RUV-W RUV-H	Residual Urine Length Residual Urine Width Residual Urine Height	Distance (mm)
PV	Prostate Volume (mm^3, cm^3, or dm^3)	PV (mm^3) = 0.52 x PV-L (mm) × PV-W (mm) × PV-H (mm) /1000
PV-L PV-W PV-H	Prostate Length Prostate Width Prostate Height	Distance (mm)
PPSA	Predicted Prostate Specific Antigen Density	PPSA (ng/mL) = 0.12 × PV
SPSA	Serum of Prostate Specific Antigen	Key in SPSA (ng)
PSAD	Prostate Specific Antigen Density	PSAD (ng/mL) = SPSA (ng)/ PV (mL), (0.01ng ≤SPSA≤100ng)

To determine the residual urine volume or prostate volume, take three measurements: length, width, and height. The system calculates the volume.

To measure RUV:

1. In the urology menu, roll the trackball to highlight **RUV**, and then press **Set**.
2. Measure the threes data: RUV-L, RUV-W and RUV-H, with distance measurement method.
3. After the three data are measured, the result of RUV is displayed in Measured Results.

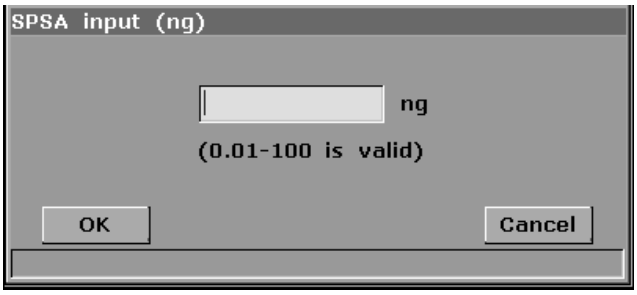
To measure PV:

The method is similar to the RUV measurement method.

To measure PSAD:

Measure PV and input SPSA. The SPSA input dialog box is as shown below:

Input the SPSA with the keyboard.



11.2. Urologic Report

After the urologic examination, the system generates a urologic worksheet.

Roll the trackball to highlight **Urol Worksheet**, and press **Set** to display **Urologic Worksheet** dialog box, as shown below.

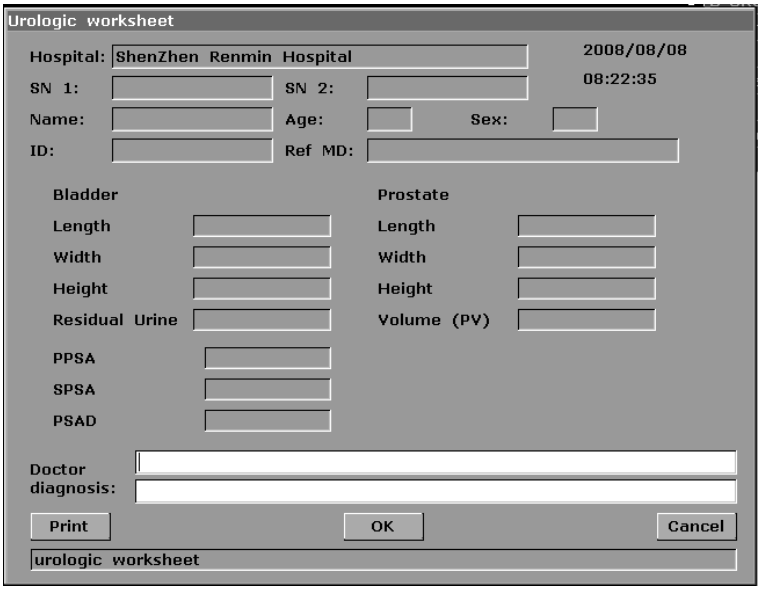


Figure 11-2 Urology Worksheet

The diagnosis editing column displays the cursor “I”, and you can enter diagnosis information.

Print the report:

Printing reference

Chapter 5.8, Printing.

Urology ultrasound report:

Urology Ultrasound Report

Hospital:

Name: ID: Age: Sex:

SN 1: SN 2: Ref MD:

Rectal digital examination: Boundary infiltration: Clinical stage:

Route: Tae/Tpe/Tre Prostate:

Symmetry: Symmetry/Asymmetry Boundary capsule: Clearness/Blur

Inner echo: homogeneity/heterogeneity Stage: I，II，III，IV

Bladder:

RUV-L mm

RUV-W mm

RUV-H mm

RUV mm^3

Prostate:

PV-L mm

PV-W mm

PV-H mm

PV mm^3

PPSA: ng/ml

SPSA: ng

PSAD: ng/ml

Ultrasonic image

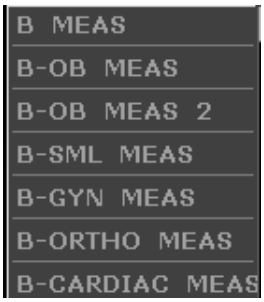
Diagnosis:

Signature (Seal)

Date

11.3. Others

If you want to begin other measurements, you can switch through the menu by pressing **Others**.



Chapter 12 Orthopedics Measurement & Calculation

The orthopedics measurement includes distance and HIP.

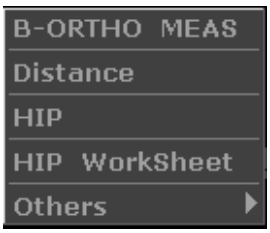


Figure 12-1 Orthopedics Measurement and Calculation Menu

12.1. Measurement and Calculation

The abbreviations used in this manual are as shown below.

Table 12-1 Orthopedics Measurement and Calculation Items

Label	Description	Method
HIP	The Angle of Hipbone (/)	HIP
α	The Angle of BL and ARL (°)	
β	The Angle of BL and IL (°)	

12.2. Orthopedics Report

After the orthopedics examination, the system generates a HIP worksheet.

Roll the trackball to highlight **HIP Worksheet**, and press **Set** to display **HIP Worksheet** dialog box, as shown below.

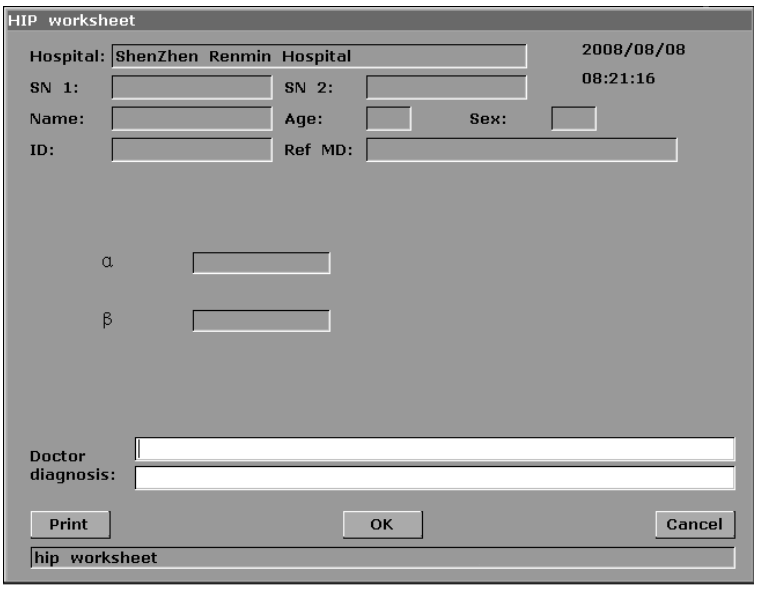


Figure 12-2 HIP Worksheet

The diagnosis editing column displays the cursor “I”, and you can enter diagnosis information.

Print the report:

Printing reference Chapter 5.8, Printing.

HIP ultrasound report:

HIP Ultrasound Report

Hospital:

Name: ID: Age: Sex:

SN 1: SN 2: Ref MD:

HIP:

α:

β:

Type:

Ultrasonic image

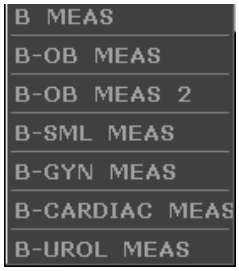
Diagnosis:

Signature (Seal)

Date

12.3. Others

If you want to begin other measurements, you can switch through the menu by pressing **Others**.



Chapter 13 Inspection and Maintenance

13.1. Life Period

The manufacturer suggests that the useful life of the DUS 3 is five years, dating from the manufacturing date marked on the rear panel label.

⚠**WARNING**⚠**:**

DO NOT use this device when its life period is exceeded..

: The equipment should be sent to the special agencies according to local regulation for separate collection after its useful life.

13.2. Daily Checklist

Check before the system is switched on:

- Visually inspect all the transducers. DO NOT use any damaged transducer.
- Visually inspect all the transducer assembly cables and associated connectors.
- Visually inspect all the power cords. DO NOT turn on the power if a cord is frayed or split, or shows signs of wear.
- Verify that the trackball is clean and free from gel or contaminants.

Check after the system is switched on:

- Visually check the on-screen display and lighting. Verify that the monitor displays the current date and time. There isn't any error message.
- Verify that the transducer identification and indicated frequency on the screen are correct for the activated transducer.
- Ensure that there isn't obvious abnormal noise, discontinuous image or dark area.
- Ensure that it isn't smelly or too hot.
- Ensure that the ultrasound window isn't too hot, checking with you hand.
- Verify that the buttons and knobs on the keyboard are good to operate.

13.3. Cleaning and Disinfection

All exterior parts of the device, including the control panel, probes, and puncture needle, should be cleaned and/or disinfected as necessary or between uses with a recommended cleaner or disinfectant. Clean each part to remove any surface particles. Disinfect the parts to kill vegetative organisms and viruses.

You must take all necessary precautions to eliminate the possibility of exposing patients, operators or third parties to hazardous or infectious materials. Use universal precautions during cleaning and disinfection. You should treat all parts of the device that come in contract with human blood or other body fluids as they were known to be infectious.

After use, clean the outer shell of the device with soft and dry cloth gently. Medical cotton ball immerged with a 75% medical alcohol solution should be used to wipe probes gently and thoroughly.

The cleaning of internal components of the device should be performed by authorized and qualified personnel.

⚠WARNING⚠:

1. To avoid electrical shock and damage to the system, always shut down and disconnect the device from the AC power source before cleaning and disinfection.
2. To avoid infection, always use protective gloves when performing cleaning and disinfecting procedures.
3. To avoid infection, ensure that the solution expiration date has not passed.

⚠CAUTION⚠:

1. Be careful when cleaning the display screen. Since the display screen is easily scratched or damaged, we should wipe it with a soft and dry cloth.
2. To avoid the possibility of electrostatic shock and damage to the system, avoid the use of aerosol spray cleaners on the monitor.
3. DO NOT clean the internal base of the device.
4. DO NOT clean the system with chlorinated or aromatic solvents, acidic or basic solutions, isopropyl alcohol or strong detergents such as ammoniated products as they may damage the surface of the system.
5. DO NOT use spray detergents on the system or it may force cleaning fluid into the system and damage electronic parts. Solvent fumes build up and form flammable gases or damage internal parts.
6. DO NOT pour any fluid onto the system surface, as fluid seepage into the electrical circuitry may cause excessive leakage current or system failure.
7. DO NOT leave residual detergent on the surface of the device.

13.3.1. System Surface Cleaning

To clean the system surface:

1. Power off the system and disconnect it from power supply.

2. Use a clean gauze pad or lint-free cloth, moistened lightly with a mild detergent, to wipe the surface.
3. After cleaning, reconnect the system to power source.

CAUTION:

Make sure the cleaning solution does not seep into the control panel or any other openings.

NOTE:

1. Take particular care when cleaning the areas near track ball and the slide controls.
2. Make sure they are free of gel and any other visible residue.

13.3.2. Probe and Probe Holder Cleaning and Disinfecting

To clean probe holder:

1. Turn the probe holder upwards and then lift the holder out of the system enclosure.
2. Wash the holder with flowing water, using a mild detergent.
3. After cleaning and drying,, turn the holder downwards to lock it.

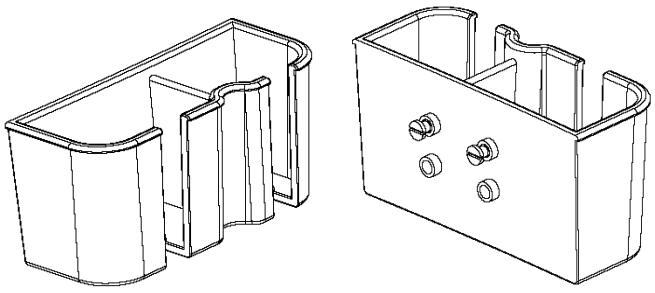


Figure 13-1 Probe Holder

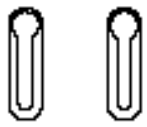


Figure 13-2 Probe Holder Pothook

Probe cleaning and/or disinfection:

◆ C361-1, L741, C321-1 and C341:

Every time before using it, layers of medical ultrasound coupling gel should be applied evenly on the area of the acoustical window of the probe, and the instrument is ready for operation. Be careful not to generate any air bubble. Disinfection should be performed each time after use.

1) Wipe off the residual coupling gel gently.
2) Use a medical cotton ball immerged with 75% medical alcohol to wipe the probe gently and thoroughly.
3) Wipe the probe with a soft cloth soaked with distilled water.

◆ E741 and E611-1:

The single-use sheath should be used on E741 and E611-1 probe.

CAUTION:

We recommend that the single-use sheath should be CE marked or FDA 510(k) cleared.

Every time before using it, layers of medical ultrasound coupling gel should be applied evenly on the area of the acoustical window of the probe. Then put on a single-use sheath, and the instrument is ready for operation. Be careful not to generate any air bubble. Disinfection should be performed each time after use.

1) Remove the sheath gently, and discard it.
2) Wipe off the residual coupling gel gently.
3) Use a medical cotton ball immerged with 75% medical alcohol to wipe the probe gently and thoroughly.
4) Wipe the probe with a soft cloth soaked with distilled water.

Prohibition

The use of diluent paint, vinyl oxide or other organic solvents is prohibited. These solvents will damage the protective film of the probe surface.

Do not immerse the transducer connector. If the cable connector is immersed, **do not** plug the connector into the system. Rinse the connector under running water and dry it thoroughly. If necessary, contact EDAN for service.

Prohibit infiltration of any type of liquid into the device or the probe.

WARNING:

1. Do not sterilize the transducer using techniques such as autoclave, ultraviolet, gamma radiation, gas, steam, or heat. Otherwise, severe damage will result.
2. The coupling gel adapted to the probe is a medial ultrasound coupling gel.
3. DO NOT immerse the power cord and connector of the probe into solutions. Transducers can be submerged to, but not including, the strain relief of the transducer array. Do not immerse or soak any part of a transducer in any cleaning material not listed in the recommended list of disinfectants. The probe has a watertight structure, IPX4. The following figure defines how much of the transducer can be submerged.

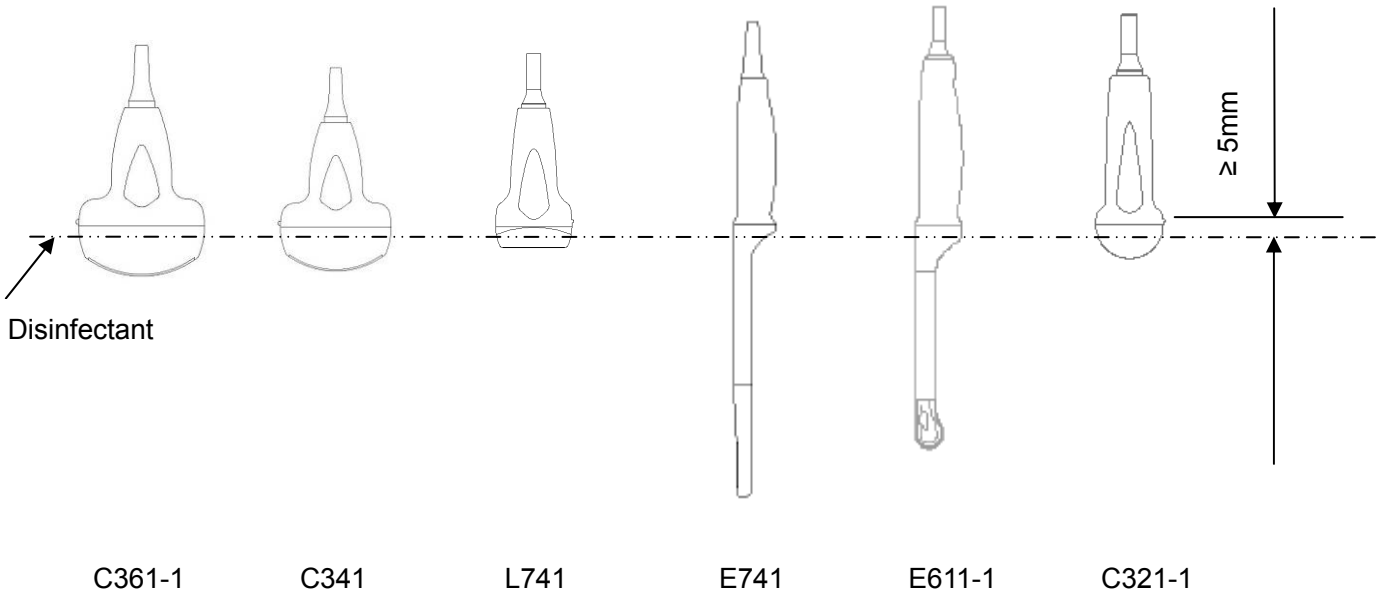


Figure 13-3 Depth of the Probe Immerged into Disinfectant

Proper Use of Probes

In order to extend the service life and to obtain optimum performance of the probe, please operate as follows:

1. Inspect power cord, socket and acoustical window of the probe periodically.
2. Shut down the machine before connecting or disconnecting the probe.
3. DO NOT drop the probe onto the floor or collide with hard objects. Otherwise it will be damaged easily.
4. When the probe is not used, put it in the probe holder.
5. Heating the probe is strictly forbidden.
6. Pulling or bending the power cord of the probe is strictly forbidden; otherwise internal connecting lines of the power cord may rupture.
7. Coupling gel can only be used on the head of the probe, and it should be wiped off after use.
8. Each time after use, clean and disinfect the probe.
9. The acoustical window and the shell of the probe should be examined frequently.

⚠WARNING⚠:

The DUS 3 cannot be used together with high-frequency surgical equipment.

CAUTION:

1. DO NOT disinfect or clean probes under high temperature, and the temperature should be below 45°C.
2. In order to avoid damaging the device, the disinfection method is limited to regular maintenance of devices in hospitals. Disinfecting instruments should be cleaned first.

13.3.3. Needle Guide Cleaning and Disinfecting

NOTE: Use proper disinfection techniques at all times to perform a biopsy.

Disinfect the needle guide before the first use and after each subsequent use.

Cleaning

You should preclean a Needle Guide before disinfecting.

To clean a Needle Guide, use a brush or cloth that has been damped with soap and water or with a specialized soap and precleaner.

Disinfecting

Always disinfect the Needle Guide after use.

13.3.4. Trackball Cleaning

To clean the trackball:

1. Remove the front panel bezel.
2. Remove the trackball.
3. Clean trackball with a tissue and isopropyl alcohol.
4. Clean the inside of the trackball assembly with a cotton swab and isopropyl alcohol.

NOTE: Make sure to clean the X and Y encoders and the idler wheel.

5. Assemble the trackball and front panel bezel till the assembly parts completely dry.

CAUTION:

DO NOT drop or place foreign objects inside the trackball assembly or it may affect the trackball operation and damage the system.

13.3.5. Disinfectants

Probe: 75% medical alcohol, Cidex (2.4%), Cidex OPA (0.55%).

Needle guide: 75% medical alcohol, Cidex (2.4%).

⚠WARNING⚠:

Be sage to choose the cleaners and disinfectants. The concentration in the air must not exceed an applicable specified limit. Comply with the manufacturer's instructions when using the cleaners and disinfectants.

13.4. Maintenance

Maintenance must be performed every 12 months, including safety and functionality of the system.

The following safety checks should be performed at least every 12 months by a qualified person who has adequate training, knowledge, and practical experience to perform these tests.

- Inspect the safety-related labels for legibility.
- Inspect the fuse to verify compliance with rated current and breaking characteristics.
- Verify that the device functions properly as described in the instructions for use.
- Test the protection earth resistance according to IEC/EN 60601-1: Limit: 0 ~ 0.1 Ω.
- Test the earth leakage current according to IEC/EN 60601-1: Limit: NC 500μA ~ SFC 1000μA.
- Test the patient leakage current according to IEC/EN 60601-1: Limit: NC 100μA ~SFC 500μA.
- Test the Covers leakage current according to IEC/EN 60601-1: Limit: NC100μA ~ SFC 500μA.
- The leakage current should never exceed the limit.

The data should be recorded in an equipment log. If the device is not functioning properly or any of the above tests fail, please contact the maintenance person of EDAN.

Chapter 14 Troubleshooting

14.1. Checkup

- Check whether the power supply works properly and the power cord is well connected and plugged into the power socket.
- Check whether the probe is properly connected to the main unit.

14.2. Troubleshooting

- Changing the cartridge fuse (by the professional personnel of EDAN).
- Troubleshooting (see table 14-1)

Table 14-1 Troubleshooting Examples

Serial No.	Problem	Solution
1	When the power switch is on, the indicator light keeps off and without image displayed.	1. Check power supply. 2. Check wires and plugs. 3. Check whether the cartridge fuse is melted. 4. Check the brightness control knob.
2	Strip-shape or snowflake-shape disturbance occurs on the display screen.	1. Inspect the power supply. 2. Check whether it is disturbed by the ignition action of any other device. 3. Check the disturbance of electric or magnetic field in the surrounding environment. 4. Check whether the plug and socket of power supply and probe are properly connected.
3	Image is not displayed clearly on the screen.	1. Adjust overall gain (Gain). 2. Adjust TGC. 3. Adjust the brightness and contrast potentiometer. 4. Adjust focus (the number and the position). 5. Clean the light filter of the display screen.
4	Near-field image is not clear.	Adjust the total gain and the upper TGC
5	Far-field image is not clear.	Adjust the total gain and the lower TGC

Chapter 15 Warranty and Service Policy

Warranty

EDAN warrants that EDAN's products meet the labeled specifications of the products and will be free from defects in materials and workmanship that occur within warranty period. The warranty period begins on the date the products are shipped to distributors.

The warranty is void in cases of:

- Damage caused by handling during shipping.
- Subsequent damage caused by improper use or maintenance.
- Damage caused by alteration or repair by anyone not authorized by EDAN.
- Damage caused by accidents.
- Replacement or removal of serial number label and manufacture label.

If a product covered by this warranty is determined to be defective because of defective materials, components, or workmanship, and the warranty claim is made within the warranty period, EDAN will, at its discretion, repair or replace the defective part(s) free of charge. EDAN will not provide a substitute product for use when the defective product is being repaired.

Service Policy

All repairs on products must be performed or approved by EDAN. Unauthorized repairs will void the warranty. In addition, whether or not covered under warranty, any product repair shall be exclusively be performed by EDAN certified service personnel.

If the product fails to function properly — or if you need assistance, service, or spare parts — contact EDAN's service center. A representative will assist you in troubleshooting the problem and will make every effort to solve it over the phone or Email, avoiding potential unnecessary returns.

In case a return can not be avoided, the representative will record all necessary information and will provide a Return Material Authorization (RMA) form that includes the appropriate return address and instructions. An RMA form must be obtained prior to any return.

Freight policy:

Under warranty: the service claimer is responsible for freight & insurance charges when a retrun is shipped to EDAN for service including custom charges. EDAN is responsible for freight, insurance & custom charges from EDAN to service claimer.

Out of warranty: the service claimer is responsible for any freight, insurance & custom charges for product.

Contact information:

If you have any question about maintenance, technical specifications or malfunctions of devices, contact your local distributor.

Alternatively, you can send an email to EDAN service department at: support@edan.com.cn.

Appendix A: Ultrasound Intensity and Safety

A1: Ultrasound in Medicine

The use of diagnostic ultrasound has proved to be a valuable tool in medical practice. Given its known benefits for non-invasive investigations and medical diagnosis, including investigation of the human fetus, the question of clinical safety with regards to ultrasound intensity arises.

There is no easy answer to the question of safety surrounding the use of diagnostic ultrasound equipment. Application of the ALARA (As Low As Reasonably Achievable) principle serves as a rule-of-thumb that will help you to get reasonable results with the lowest possible ultrasonic output.

The American Institute of Ultrasound in Medicine (AIUM) states that given its track record of over 25 years of use and no confirmed biological effects on patients or instrument operators, the benefits of the prudent use of diagnostic ultrasound clearly outweigh any risks.

A2: Ultrasound Safety and the ALARA Principle

Ultrasound waves dissipate energy in the form of heat and can therefore cause tissue warming. Although this effect is extremely low with Transcranial Doppler, it is important to know how to control and limit patient exposure. Major governing bodies in ultrasound have issued statements to the effect that there are no known adverse effects from the use of diagnostic ultrasound, however, exposure levels should always be limited to As Low As Reasonably Achievable (the ALARA principle). You can control the ultrasonic power or patient exposure to ultrasound in any of the following three ways:

- Adjust the pulse strength (amplitude)
- Adjust the duration of the pulse (pulse duration)
- Adjust the pulse rate (pulse repetition frequency or PRF)

To change these settings for your system, use the following controls:

Amplitude

The power setting directly influences the amplitude of the pulse burst. A higher setting increases the amplitude, resulting in a higher ultrasound output at the transducer.

Sample Volume

The Sample volume is the axial length of the area from which the Doppler signals are obtained. The larger the sample volume, the longer the duration of the pulse burst, and consequently the higher the ultrasound output and power.

Spectrum Velocity Scale

The higher the scale setting, the higher the pulse repetition frequency (number of pulses per second), and consequently higher ultrasound output. More pulses per second are equivalent to a

higher power output.

Proper use of these instrument settings can minimize patient exposure, and optimize the results and efficiency of the equipment.

Always apply the ALARA principle; use power levels that are: As Low As Reasonably Achievable.

Imaging Functions Affecting Acoustic Output

In addition to the level of voltage transmitted, adjustment of the following imaging functions and /or controls may affect the acoustic output.

Item	Affection
Probe	Acoustic output is changed as changing probes.
Imaging mode	There are different parameters applied in B mode and M mode, so acoustic output will be changed as changing between B mode and M mode. Generally, the acoustic output of M mode is lower than the B mode.
Field of view (scan angle or scan width)	Frame rate may be changed as changing the scan angle of the scan width, and the acoustic output will be changed.
Image depth	Pulse repeated frequency will be changed as changing the image depth, and the acoustic output will be changed.
Focus number	Frame rate and focus position will be changed as changing the focus number, and acoustic output will be changed.
Focus position	Acoustic output will be changed as changing the focus position even the beam power level and the beam aperture have not been changed. Generally, the acoustic output will be higher as getting nearer to probe.
Freeze	When freezing the system, it will stop transmitting ultrasonic wave.
Transmission power	The output of probe will be changed as changing the transmission power, and acoustic output will be changed.
Multi-frequency	The character of the wave focus will be changed as changing the frequency, and acoustic output will be changed.
Line density	The acoustic output will be changed as changing the number of the scanning line (line density).
Presets	Presets contain all the parameters above, so any change of the presetting will change acoustic output.
Restart, or power on/off	System will return to the default set when restarting, or powering on/off the system, and acoustic output will be changed.

A3: Probe Acoustic Output Parameters List

A3.1 : Test of Probe C361-1

Transducer Type: C361-1

Test Item	B (3.5 MHz)	B (2.5 MHz)	B (5.0 MHz)
p-, MPa	2.06	1.461	1.89
$I_{spta,}$ mW/cm^2	16.25	15.32	10.89
System settings	Single Focus=40mm, Depth=40mm AP=15; Scan Angle=30°		
$Z_{p,}$ mm	40	40	44
$W_{pb6,}$ (∥), mm (⊥), mm	2.4 5.1	2.7 5.4	2.2 4.3
prr, kHz	--	--	--
srr, Hz	93	93	93
Output beam Dimensions, cm^2	3.15	1.92	1.92
$f_{awf,}$ MHz	1.92	2.7	3.9
APF, %	0	0	0
AIF, %			
Maximum power, mW	50.88	52.93	26.62
$I_{ob,}$ mW/cm^2	26.5	27.57	13.86
Power-up mode	B mode	B mode	B mode
Initialization mode	B mode	B mode	B mode
Acoustic output freeze	Yes	Yes	Yes
Z_{tt} (mm)	--	--	--
Z_{ts} (mm)	contact		
Inclusive modes	--	--	--
Note: APF: Acoustic power-up fraction, AIF: Acoustic initialization fraction			

A3.2 ：Test of Probe L741/E741

Transducer Type: L741/E741

Test Item	B (6.0 MHz)	B (8.0 MHz)	B (10.0 MHz)
p-, MPa	3.22	2.56	1.99
$I_{spta,}$ mW/cm^2	21.98	13.55	4.1
System settings	Single Focus=40mm, Depth=40mm AP=15; Scan Angle=30°		
$Z_{p,}$ mm	28	31	32
$W_{pb6,}$ (∥), mm (⊥), mm	1.2 1.3	1.1 1.0	1.1 1.0
prr, kHz	--	--	--
srr, Hz	93	93	93
Output beam Dimensions, cm^2	0.48	0.48	0.48
$f_{awf,}$ MHz	6.53	7.4	8.4
APF, %	0	0	0
AIF, %			
Maximum power, mW	7.77	4.37	1.29
$I_{ob,}$ mW/cm^2	16.19	9.1	2.69
Power-up mode	B mode	B mode	B mode
Initialization mode	B mode	B mode	B mode
Acoustic output freeze	Yes	Yes	Yes
Z_{tt} (mm)	--	--	--
Z_{ts} (mm)	contact		
Inclusive modes	--	--	--
Note: APF: Acoustic power-up fraction, AIF: Acoustic initialization fraction			

A3.3 ：Test of Probe C341

Transducer Type: C341

Test Item	B (3.5 MHz)	B (2.5MHz)	B (5.0 MHz)
p-, MPa	1.79	1.41	1.56
$I_{spta,}$ mW/cm^2	17.34	18	11.07
System settings	Single Focus=40mm, Depth=40mm AP=15; Scan Angle=30°		
$Z_{p,}$ mm	38	43	43
$W_{pb6,}$ (∥), mm (⊥), mm	2.5 6.2	3.0 5.1	2.3 4.7
prr, kHz	--	--	--
srr, Hz	93	93	93
Output beam Dimensions, cm^2	1.92	1.92	1.92
$f_{awf,}$ MHz	3.24	2.73	3.9
APF, %	0	0	0
AIF, %			
Maximum power, mW	46.24	47.07	23.65
$I_{ob,}$ mW/cm^2	24.08	24.52	12.32
Power-up mode	B mode	B mode	B mode
Initialization mode	B mode	B mode	B mode
Acoustic output freeze	Yes	Yes	Yes
Z_{tt} (mm)	--	--	--
Z_{ts} (mm)	contact		
Inclusive modes	--	--	--
Note: APF: Acoustic power-up fraction, AIF: Acoustic initialization fraction			

A3.4 ：Test of Probe C321-1

Transducer Type: C321-1

Test Item	B (3.5 MHz)	B (2.5MHz)	B (5.0 MHz)
p-, MPa	1.67	1.243	1.37
$I_{spta,}$ mW/cm^2	22.43	17.58	13.53
System settings	Single Focus=30mm, Depth=30mm AP=15; Scan Angle=45°	Single Focus=40mm, Depth=40mm AP=15; Scan Angle=45°	
$Z_{p,}$ mm	28	26	30
$W_{pb6,}$ (∥), mm (⊥), mm	2.02 3.97	2.25 3.61	1.78 3.77
prr, kHz	--	--	--
srr, Hz	93	93	93
Output beam Dimensions, cm^2	0.96	0.96	0.96
$f_{awf,}$ MHz	3.38	2.79	3.91
APF, %	--	--	--
AIF, %	--	--	--
Maximum power, mW	22.13	18.79	13.46
$I_{ob,}$ mW/cm^2	23.05	19.57	14.02
Power-up mode	B mode	B mode	B mode
Initialization mode	B mode	B mode	B mode
Acoustic output freeze	Yes	Yes	Yes
Z_{tt} (mm)	--	--	--
Z_{ts} (mm)	contact		
Inclusive modes	--	--	--
Note: APF: Acoustic power-up fraction, AIF: Acoustic initialization fraction			

A3.5 ：Test of Probe E611-1/6.0MHz under B-MODE

Transducer Type: E611-1 Test Mode: B mode Working Frequency: 6.0MHz

Test Item	Results
p-, MPa	1.504
$I_{spta,}$ mW/cm^2	37.15
System settings	Single Focus=20mm, Depth=40mm AP=15; Scan Angle=60°
$Z_{p,}$ mm	17.0
$W_{pb6,}$ (∥), mm (⊥), mm	5.52 2.13
prr, kHz	--
srr, Hz	106.5
Output beam Dimensions, cm^2	0.65
$f_{awf,}$ MHz	6.40
APF, %	0
AIF, %	9.6
Maximum power, mW	14.1
$I_{ob,}$ mW/cm^2	21.69
Power-up mode	B mode
Initialization mode	B mode
Acoustic output freeze	Yes
Z_{tt} (mm)	--
Z_{ts} (mm)	contact
Inclusive modes	B/M mode, M mode
Note: APF: Acoustic power-up fraction AIF: Acoustic initialization fraction	

A4: Transducer Power Values

Measurement uncertainties

Measurement uncertainty for ultrasonic power: ±26.6%

Measurement uncertainty for pressure: ±13.7%

Measurement uncertainty for intensities: ±26.6%

Measurement uncertainty for central frequency: ±2%

Derated, and water value intensities

All intensity parameters are measured in water. Since water does not absorb acoustic energy, these water measurements represent a worst case value. Biological tissue does absorb acoustic energy. The true value of the intensity at any point depends on the amount, type of tissue, and the frequency of the ultrasound passing through the tissue. The intensity value in the tissue, has been estimated by using the following formula:

Since this value is not the true In Situ intensity, the term “derated” is used to qualify it.

$$\text{Derated} = \text{Water}\,[e^{-0.069 f_c z}]$$

Where:

Water = Water intensity value

e = 2.1783

z = skinline to measurement depth in cm

fc = center frequency of the transducer of the transducer/system/mode combination in MHz

Transducer type: C361-1;

Operating mode: B Mode; Working frequency: 3.5MHz

Acoustic Output				MI	$I_{SPTA.3}$ (mW/cm^2)	$I_{SPPA.3}$ (W/cm^2)
Global Maximum Value				0.52	9.98	109.7
Associated Acoustic Parameter	$p_{r.3}$		(MPa)	0.937		
	W_0		(mW)		47.86	47.86
	F_c		(MHz)	3.21	3.21	3.21
	Z_{sp}		(cm)	3.8	3.8	3.8
	Beam dimensions	x_{-6}	(cm)		0.23	0.23
		y_{-6}	(cm)		0.5	0.5
	PD		(μsec)	0.46		0.46
	PRF		(Hz)	4682		4682
	EDS	Az.	(cm)		1.277	
		Ele.	(cm)		1.5	
Operating Control Conditions	AP=15; Focus=40mm; Depth=40mm; Angle=30^0					

Transducer type: C341;

Operating mode: B Mode; Working frequency: 3.5MHz

Acoustic Output				MI	$I_{SPTA.3}$ (mW/cm^2)	$I_{SPPA.3}$ (W/cm^2)
Global Maximum Value				0.51	10.46	74.84
Associated Acoustic Parameter	$p_{r.3}$		(MPa)	0.918		
	W_0		(mW)		43.92	43.92
	F_c		(MHz)	3.18	3.18	3.18
	Z_{sp}		(cm)	3.4	3.4	3.4
	Beam dimensions	x_{-6}	(cm)		0.25	0.25
		y_{-6}	(cm)		0.56	0.56
	PD		(μsec)	0.49		0.49
	PRF		(Hz)	4682		4682
	EDS	Az.	(cm)		1.277	
		Ele.	(cm)		1.5	
Operating Control Conditions	AP=15; Focus=40mm; Depth=40mm; Angle=45^0					

Transducer type: C321-1;

Operating mode: B Mode; Working frequency: 3.5MHz

Acoustic Output				MI	$I_{SPTA.3}$ (mW/cm^2)	$I_{SPPA.3}$ (W/cm^2)
Global Maximum Value				0.67	16.4	131.2
Associated Acoustic Parameter	$p_{r.3}$		(MPa)	1.207		
	W_0		(mW)		26.75	26.75
	F_c		(MHz)	3.23	3.23	3.23
	Z_{sp}		(cm)	2.3	2.3	2.3
	Beam dimensions	x_{-6}	(cm)		0.2	0.2
		y_{-6}	(cm)		0.45	0.45
	PD		(μsec)	0.45		0.45
	PRF		(Hz)	4682		4682
	EDS	Az.	(cm)		0.64	
		Ele.	(cm)		1.5	
Operating Control Conditions	AP=15; Focus=40mm; Depth=40mm; Angle=45^0					

Transducer type: E611-1;

Operating mode: B Mode; Working frequency: 6.5MHz

Acoustic Output				MI	$I_{SPTA.3}$ (mW/cm^2)	$I_{SPPA.3}$ (W/cm^2)
Global Maximum Value				0.33	9.51	32.58
Associated Acoustic Parameter	$p_{r.3}$		(MPa)	0.868		
	W_0		(mW)		9.575	9.575
	F_c		(MHz)	6.74	6.74	6.74
	Z_{sp}		(cm)	1.9	1.9	1.9
	Beam dimensions	x_{-6}	(cm)		0.65	0.65
		y_{-6}	(cm)		0.19	0.19
	PD		(μsec)	0.25		0.25
	PRF		(Hz)	4682		4682
	EDS	Az.	(cm)		0.544	
		Ele.	(cm)		0.6	
Operating Control Conditions	AP=15; Focus=40mm; Depth=40mm; Angle=60^0					

Transducer type: L741;

Operating mode: B Mode; Working frequency: 6.0MHz

Acoustic Output				MI	$I_{SPTA.3}$ (mW/cm^2)	$I_{SPPA.3}$ (W/cm^2)
Global Maximum Value				0.49	12.99	99.68
Associated Acoustic Parameter	$p_{r.3}$		(MPa)	1.174		
	W_0		(mW)		5.53	5.53
	F_c		(MHz)	6.24	6.24	6.24
	Z_{sp}		(cm)	2.4	2.4	2.4
	Beam dimensions	x_{-6}	(cm)		0.12	0.12
		y_{-6}	(cm)		0.16	0.16
	PD		(μsec)	0.26		0.26
	PRF		(Hz)	4682		4682
	EDS	Az.	(cm)		0.544	
		Ele.	(cm)		0.6	
Operating Control Conditions	AP=15; Focus=30mm; Depth=30mm; Scan Distance=20mm					

Transducer type: E741;

Operating mode: B Mode; Working frequency: 6.0MHz

Acoustic Output				MI	$I_{SPTA.3}$ (mW/cm^2)	$I_{SPPA.3}$ (W/cm^2)
Global Maximum Value				0.44	9.636	103.7
Associated Acoustic Parameter	$p_{r.3}$		(MPa)	1.208		
	W_0		(mW)		5.026	5.026
	F_c		(MHz)	6.21	6.21	6.21
	Z_{sp}		(cm)	2.4	2.4	2.4
	Beam dimensions	x_{-6}	(cm)		0.12	0.12
		y_{-6}	(cm)		0.12	0.12
	PD		(μsec)	0.25		0.25
	PRF		(Hz)	4682		4682
	EDS	Az.	(cm)		0.544	
		Ele.	(cm)		0.6	
Operating Control Conditions	AP=15; Focus=30mm; Depth=30mm; Scan Distance=20mm					

Appendix B: Obstetrical References

Gestational Sac Diameter

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Crown Rump Length

Hadlock FP, Shah YP, Kanon DJ, et al. “Fetal Crown-Rump Length: Reevaluation of Relation to Menstrual Age (5-18 weeks) with High-Resolution Real-Time US.” Radiology 182 (2):501,1992.

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Wu Zhongyu, “Ultrasound Diagnosis in Obstetrics and Gynecology”, Tianjin Science and Technology Publisher, 1995

Biparital Diameter

Hadlock FP, Deter RL, et al. “Estimationg Fetal Age: Computer-Assisted Analysis of Multiple Fetal Growth Parameters.” Radilolgy 152:497, 1984.

Merz E. Ultrasound in Gynexology and Obstetrics. Stuttgart and New York: Thieme Medical Publishers, Inc., 1991, p. 326.

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Fetal Growth Chart Using the Ultrasonotomographic Technique, Keiichi Kurachi, Mineo Aoki, Department of Obstetrics and Gynecology, Osaka University Medical School Revision 3 (September 1983)

Studies on Fetal Growth and Functional Developments, Takashi Okai, Department of Obstetrics and Gynecology, Faculty of Medicine, University of Tokyo

Wu Zhongyu, “Ultrasound Diagnosis in Obstetrics and Gynecology”, Tianjin Science and Technology Publisher, 1995

Head Circumference

Hadlock FP, Deter RL, et al. “Estimationg Fetal Age: Computer-Assisted Analysis of Multiple Fetal Growth Parameters.” Radilolgy 152:497, 1984.

Merz E. Ultrasound in Gynexology and Obstetrics. Stuttgart and New York: Thieme Medical Publishers, Inc., 1991, p. 326.

Abdominal Circumference

Hadlock FP, Deter RL, et al. “Estimationg Fetal Age: Computer-Assisted Analysis of Multiple Fetal Growth Parameters.” Radilolgy 152:497, 1984.

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Femur Length

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Studies on Fetal Growth and Functional Developments

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Appendix C: Measurement Accuracy

Parameter	Range	Accuracy
Image depth range	R60: 40mm~240mm; L43: 30mm~100mm; R10: 40mm~100mm; R20: 40mm~240mm; R40: 40mm~240mm.	<±4% of full scale
M-mode time range	3, 6, 15, 25 s	<±0.3% of full scale
Two-dimension Measurement		
Distance/depth	up to 246 mm	< ±4% or < 2 mm, if below 40 mm
Area (Trace)	up to 720 cm^2	< ±8% or < 130 mm^2, if below 1600 mm^2
Area (Ellipse)	up to 720 cm^2	< ±8% or < 130 mm^2, if below 1600 mm^2
Angle	0º to 180º	< ±3% on 1/2 segment
Ratio (A>B)		
-Result B/A and (A-B)/A -Result A/B	up to 1.0 1.0 to 99.9	< ±10% of A < ±10% of A
Time Motion (TM) Measurement		
Depth	up to 240 mm	< ±4% or < 2 mm, if below 40 mm
Time	up to 25 sec	< ± 1%
Heart rate	15 to 999 bpm	< ±5%
Velocity (ratio)	up to 999 mm/sec	< ±5%
Volume Measurement		
Volume (area, length, diameter)	up to 999 cm^3	< ±12% or <8000 mm^3, if below 64000 mm^3
Thyroid gland volume	up to 999 cm^3	< ±12% or <8000 mm^3, if below 64000 mm^3
Residual urine volume	up to 999 mL	< ±12% or <8000 mm^3, if below 64000 mm^3
Prostate volume	up to 999 cm^3	< ±12% or <8000 mm^3, if below 64000 mm^3

Appendix D: EMC Information-Guidance and Manufacture's Declaration

Guidance and manufacture's declaration-electromagnetic emissions-
For all EQUIPMENT and SYSTEMS

<table>
<tr><th colspan="3">Guidance and manufacture's declaration-electromagnetic emission</th></tr>
<tr><td colspan="3">The DUS 3 is intended for use in the electromagnetic environment specified below; The customer or the user of the DUS 3 should assure that it is used in such and environment.</td></tr>
<tr><th>Emission test</th><th>Compliance</th><th>Electromagnetic environment-guidance</th></tr>
<tr><td>RF emissions
CISPR 11</td><td>Group 1</td><td>The DUS 3 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.</td></tr>
<tr><td>RF emissions
CISPR 11</td><td>Class A</td><td rowspan="3">The DUS 3 is suitable for use in all establishments, other than domestic and those directly connected to the public low-voltage power supply network that supplies building used for domestic purposes.</td></tr>
<tr><td>Harmonic emissions
IEC 61000-3-2</td><td>Class A</td></tr>
<tr><td>Voltage fluctuations/flicker emissions
IEC61000-3-3</td><td>Complies</td></tr>
</table>

Guidance and manufacture's declaration – electromagnetic immunity – for all EQUIPMENT and SYSTEMS

Guidance and manufacture's declaration – electromagnetic immunity			
The DUS 3 is intended for use in the electromagnetic environment specified below. The customer or the user of the DUS 3 should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment -guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floor are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines	±2KV for power supply lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Power frequency (50/60Hz) magnetic field IEC61000-4-8	3A/m	3A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% UT (>95% dip in UT) for 0.5 cycle 40% UT (60% dip in UT) for 5 cycles 70% UT (30% dip in UT) for 25 cycles <5% UT (>95% dip in UT) for 5 sec	<5% UT (>95% dip in UT) for 0.5 cycle 40% UT (60% dip in UT) for 5 cycles 70% UT (30% dip in UT) for 25 cycles <5% UT (>95% dip in UT) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment. If the user of the DUS 3 requires continued operation during power mains interruptions, it is recommended that the DUS 3 be powered from an uninterruptible power supply or a battery.
NOTE UT is the a.c. mains voltage prior to application of the test level.			

Guidance and manufacture's declaration – electromagnetic immunity – for EQUIPMENT and SYSTEMS that are not LIFE-SUPPORTING

Guidance and manufacture's declaration – electromagnetic immunity

The DUS 3 is intended for use in the electromagnetic environment specified below. The customer or the user of DUS 3 should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment -guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the DUS 3, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d = \left[\frac{3.5}{V_1}\right]\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	$d = \left[\frac{3.5}{E_1}\right]\sqrt{P}$ 80 MHz to 800 MHz $d = \left[\frac{7}{E_1}\right]\sqrt{P}$ 800 MHz to 2.5 GHz Where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and *d* is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol:

NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the DUS 3 is used exceeds the applicable RF compliance level above, the DUS 3 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the DUS 3

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than *3 V/m*.

Recommended separation distances between portable and mobile RF communication equipment and the EQUIPMENT or SYSTEM- For EQUIPMENT or SYSTEM that are not LIFE-SUPPORTING

Recommended separation distances between portable and mobile RF communications equipment and the DUS 3

The DUS 3 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the DUS 3 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the DUS 3 as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter (W)	**Separation distance according to frequency of transmitter (m)**		
	150 kHz to 80 MHz $d = \left[\frac{3.5}{V_1}\right]\sqrt{P}$	**80 MHz to 800 MHz** $d = \left[\frac{3.5}{E_1}\right]\sqrt{P}$	**800 MHz to 2.5 GHz** $d = \left[\frac{7}{E_1}\right]\sqrt{P}$
0.01	**0.12**	**0.12**	**0.23**
0.1	**0.37**	**0.37**	**0.73**
1	**1.2**	**1.2**	**2.3**
10	**3.7**	**3.7**	**7.3**
100	**12**	**12**	**23**

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Appendix E: Order List

The following accessories are recommended to be used on the DUS 3.

⚠**WARNING**⚠**:** Probes and other accessories used on the DUS 3 must be provided or recommended by EDAN. Otherwise, the device may be damaged.

Part Name	**Part Number**
Probe C321-1	MS3-102577
Probe E611-1	MS3-102578
Probe L741	MS3-102579
Probe E741	MS3-102581
Probe C361-1	MS3-102388
Probe C341	MS3-102575
Needle Guide Bracket Kit BGK-CR60	MS3-102338
Needle Guide Bracket Kit BGK-CR40	MS3-102346
Needle Guide Bracket Kit BGK-CR20	MS3-102380
Needle Guide Bracket Kit BGK-CR10	MS3-102364
Needle Guide Bracket Kit BGK-LA43	MS3-102355
Coupling gel	M50-78001
Foot switch	MS3R-102414
Probe Holder	MS4-102422
MT-802 Mobile Trolley	MS9-102423
Hand Carried Bag	MS1-102424
Video Printer (SONY UP-897MD)	M18-520146
Video Printer (MITSUBISHI P93W)	M18-52147
Silica Gel Pad	MS1R-109693

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